

**City of Bradford MDC**

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# 2016 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the  
Environment Act 1995  
Local Air Quality Management

January, 2017

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## Executive Summary: Air Quality in Our Area

### Air Quality in Bradford

Air pollution is associated with a number of adverse health impacts and is recognised as a contributory factor in the onset of heart disease and some cancers. Air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions and there is frequently a strong correlation with equality issues, because areas with poor air quality are often less affluent<sup>1,2</sup>.

The annual cost to society of the health impacts of particulate matter alone in the UK is estimated to be in the region of £16 billion<sup>3</sup>.

The air pollutants of concern in Bradford are nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM). A significant source of these pollutants is traffic but industry, heat and power generation, domestic sources and natural activities also contribute.

For some pollutants the government has set health based objective levels which Local Authorities must comply with. Where these objectives are not met, Local Authorities must declare **Air Quality Management Areas (AQMAs)** and draw up **Air Quality Action Plans (AQAPs)** to improve air quality.

### Air Quality Management Areas in Bradford

Currently Bradford has four Air Quality Management Areas (AQMAs). These are located close to the city centre at Manningham Lane, Thornton Road, Mayo Avenue / Manchester Road and Shipley Airedale Road (Figure 1). The AQMAs were declared in 2006.

This report presents the air quality data for the 2015 calendar year. During 2015 the annual average NO<sub>2</sub> objective continued to be breached in the AQMAs located at Mayo Avenue, Manningham Lane and Shipley Airedale Road. For the first time since monitoring began there was no exceedance of the annual average objective at the Thornton Road location.

The hourly NO<sub>2</sub> objective was not exceeded at any of the AQMAs during 2015.

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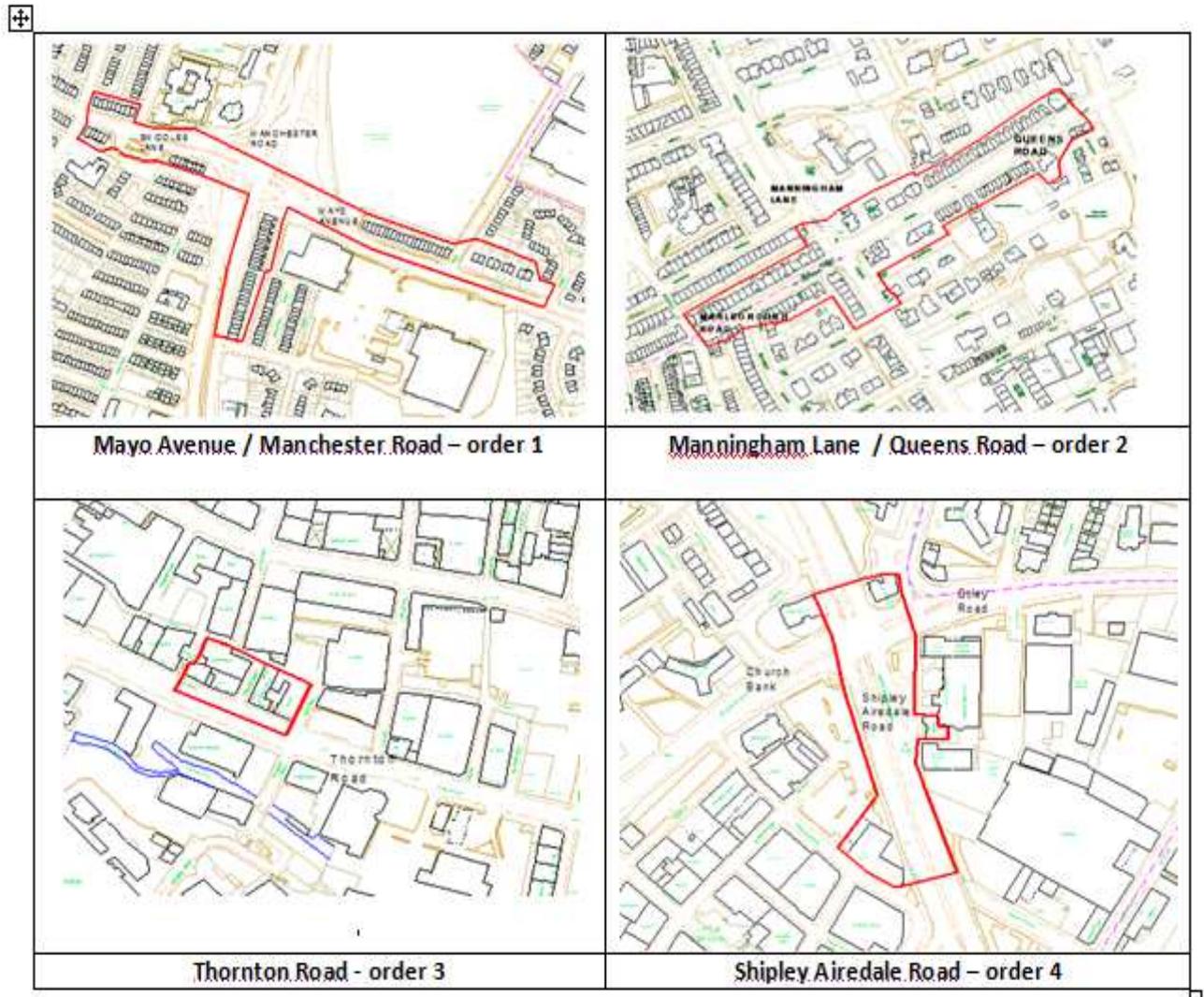
<sup>1</sup> Environmental equity, air quality, socioeconomic status and respiratory health, 2010

<sup>2</sup> Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

<sup>3</sup> Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Figure 1: Bradford AQMAs

**Bradford AQMAs**



**Air quality trends in the AQMAs**

The annual average NO<sub>2</sub> concentration recorded at Shipley Airedale Road in 2015 was lower than any other recorded in the previous five years. There is some evidence of a long term improvement in air quality at this location.

At Mayo Avenue the level recorded in 2015 (42µg/m<sup>3</sup>) was the same as that measured in 2014. This is a large reduction when compared to levels recorded in earlier years of monitoring (which regularly exceeded 70µg/m<sup>3</sup>). It would appear that there has been an improvement in air quality at this location for the last two years.

At Thornton Road there was a significant reduction in the annual average concentration recorded in 2015 when compared with the previous four years. Whilst this is a very encouraging, it is too early to conclude that air quality will continue to improve in this location.

There is insufficient reliable long term data from the Manningham Road site to enable any conclusion about the longer term air quality trend at this particular location to be reached at present. This is due to problems with monitoring equipment which have now been rectified.

### Additional areas of air quality concern in Bradford

Since the declaration of the current AQMAs, the City of Bradford MDC has identified three additional areas of the city where elevated NO<sub>2</sub> concentrations have been recorded (Bradford USA report 2015). These are located at:

- Saltaire Road / Bradford Road junction
- Rook Lane / Rooley Lane / Tong Street area
- Harrogate Road / Killinghall Road/ Dudley Hill Road crossroads

The monitoring results obtained in 2015 indicate that the annual average NO<sub>2</sub> objective continues to be exceeded in the Saltaire Road / Bradford Road area and at some locations in the Rook Lane / Rooley Lane / Tong Street area. The most recent results for the Harrogate Road / Killinghall Road/ Dudley Hill Road crossroads area indicate that levels have reduced slightly and are now in line with the objective.

In response to these latest monitoring results the City of Bradford MDC now intends to:

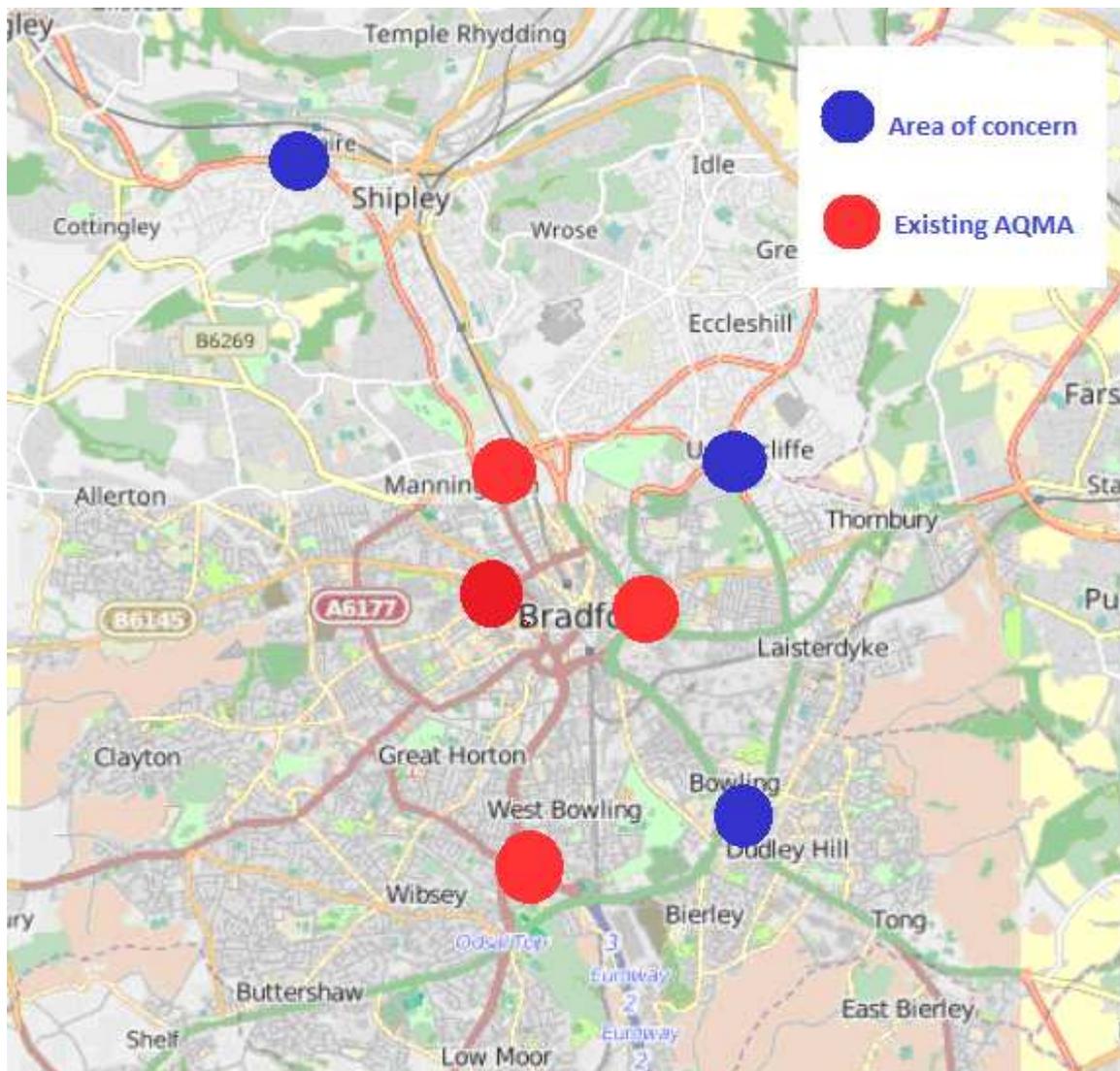
- progress the declaration of a further AQMA at the Saltaire Road / Bradford Road junction as practicably as possible. An update on this will be provided in future ASR reports.
- Further review the concentrations in the Rook Lane / Rooley Lane / Tong Street area when analysing data for the 2017 ASR report. Additional continuous and passive diffusion tube monitoring has recently been established in this area and will be used to assist in the determination of whether an AQMA declaration is necessary in all, or part, of this location.

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- Further review the concentrations in the Harrogate Road / Killinghall/ Dudley Hill area when analysing data for the 2017 ASR. If 2016 levels continue to remain below the objective then no declaration will take place. Ongoing monitoring will be continued in the area until such time as the City of Bradford MDC is satisfied that there is no further risk of the air quality objectives being breached.

The approximate location of the existing AQMAs and the additional areas of concern are shown in Figure 2.

**Figure 2: Current AQMAs and additional areas of air quality concern in Bradford**



## Actions to Improve Air Quality in Bradford

The measures being taken by the City of Bradford MDC to improve air quality are detailed in the following documents:

- Air Quality Action Plan (2009)
- Air Quality Strategy (2011)
- Bradford Low Emission Strategy (2013)
- West Yorkshire Low Emission Strategy (WYLES)<sup>4</sup>

The documents can be viewed at:

<https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/>.

The approaches employed to improve air quality in Bradford are;

- a) **Education and research** - measures that help people to understand the sources of pollutants, how they impact on their health and how emissions and exposure to air pollutants can be reduced or avoided;
- b) **Trip reduction** – measures which reduce the overall numbers of journeys taken in motor vehicles across the district. This includes investment in sustainable transport measures, enabling more people to walk, cycle or use public transport. It also incorporates measures that encourage people to share vehicles (such as car share schemes and car clubs) and measures that encourage working or studying from home.
- c) **Emission reduction measures** – these are measures to reduce the total emissions from individual vehicles. This can be achieved by fitting emission abatement equipment to existing vehicles, replacing older vehicles with newer ones or by completely changing the technology and fuels used. For example, ultra low emission vehicles fuelled by electric or gas are much cleaner than those that use diesel. Procuring low emission goods and services is a significant element of this strategy

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<sup>4</sup> This report covers the actions undertaken during the calendar year 2015 to improve air quality in Bradford. During this period the West Yorkshire Low Emission Strategy (WYLES) was in draft format but has since been completed and was fully adopted in Bradford in December 2016 and all other West Yorkshire Councils. The link provided is to the final version of the document, not the draft version available in 2015.

- d) **Planning measures** - these are measures designed to reduce the emission impact of future developments in Bradford, primarily in terms of traffic pollution, but also incorporating heating and other combustion sources, dust generation and industrial processes. The aim is to keep any additional trips to a minimum and ensure that the planning approval process assists in the delivery of the infrastructure needed to support the future use of sustainable transport or ultra low emission vehicles. For example, a developer may be required to provide a new cycle lane and / or electric vehicle recharging points for a new development.

The policy document facilitating air quality improvement and associated emission reductions in Bradford during 2015 was the **Bradford Low Emission Strategy (LES)** that was adopted in 2013. This document places low emission measures and the need to improve air quality at the heart of local decision making processes, driving air quality improvement and attracting inward investment for sustainable transport and low emission technology projects. Progress on delivery of the Bradford LES is reported to the Health and Well Being board, ensuring that achievement of the best possible air quality outcomes for the whole of the Bradford population is a key objective, not solely compliance with air quality objectives. Table 1 summarises air quality improvement measures in Bradford.

Some of the air quality improvement measures undertaken in Bradford during 2015 were also driven by the development of the West Yorkshire Low Emission Strategy (WYLES), which during 2015 was still in a development phase. This document has since been fully adopted in Bradford (December 2016) and further details will be provided in the 2017 ASR.

Table 1: Bradford Air Quality Improvement Measures

Strategy / Policy Area	Measures undertaken up to and including 2015	Planned progress for 2016
<b>Bradford Low Emission Strategy (LES)</b>	<p>An over-arching City of Bradford MDC internal strategy to improve air quality through integrated policy development focusing on measures to reduce vehicle emissions. Adopted by Full Council, 5<sup>th</sup> November 2013</p>	<p>Review and updating of the Bradford LES, building on the measures outlined below and incorporating additional measures developed as part of the WYLES.</p> <p>The Bradford LES update is planned for publishing in Summer 2017.</p>
<b>West Yorkshire Low Emission Strategy</b>	<p>Bradford MDC has secured funding for, and co-ordinated the development of, the West Yorkshire Low Emission Strategy (WYLES) in partnership with all the West Yorkshire Councils, West Yorkshire Combined Authority (WYCA) and PHE. This is an over-arching county wide strategy to improve air quality in the West Yorkshire region through integrated policy development.</p> <p>The draft WYLES consultation was commenced in 2015 and includes the following measures for County-wide implementation:</p> <ul style="list-style-type: none"> <li>• Bus emission standards, recognizing urban hotspots</li> <li>• Extrapolation of the Bradford Leeds LEZ Study County-wide using CAZ standard data</li> <li>• Public health awareness raising of emissions and impact on health</li> <li>• West Yorkshire Electric Vehicle Strategy</li> <li>• Emission standards for taxis and promotion of ultra-low emission vehicles</li> <li>• CAZ to be introduced where necessary</li> <li>• Consistent mitigation measures to be applied through the planning process</li> <li>• Consistent procedures to consider vehicle emissions through Social Value public sector procurement</li> <li>• Eco Stars Scheme for Council Fleets, bus operators and freight companies<sup>5</sup></li> </ul>	<p>Formal adoption of the WYLES across all partners in the West Yorkshire region and implementation of the specific measures within it. Further update on adoption and progress with WYLES measures to be provided in 2017 ASR report.</p>

<sup>5</sup> <http://www.westyorks-ca.gov.uk/News/Articles/ECO-Stars/>

<p><b>Environmental Health &amp; Public Health</b></p>	<p>Completed an innovative Low Emission Zone (LEZ) feasibility study in partnership with Leeds City Council, Bradford NHS/Public Health England (PHE)/Leeds University and York University Centre for Health Economics which examined emission changes and impact on air quality levels and health/health costs of the following scenarios:</p> <ul style="list-style-type: none"> <li>• Improving bus and HGV emissions</li> <li>• Reducing traffic, through cycling and walking</li> <li>• Introducing electric vehicles</li> <li>• Switching passenger cars from diesel to petrol</li> </ul> <p>LEZ feasibility study<sup>6</sup> was reported to Bradford Council Elected Members in 2015 with a subsequent Council decision to investigate the feasibility of implementing a LEZ in Bradford</p> <p>Public Health research projects undertaken in collaboration with environmental epidemiologists and health researchers at Born In Bradford on:</p> <ul style="list-style-type: none"> <li>• school travel (including development of toolkit)</li> <li>• assessment of exposure of school children to air pollution as part of Born in Bradford ‘Better Start Project’ Project</li> </ul>	<p>Update on any future LEZ /CAZ planned for Bradford to be provided in 2017 ASR.</p> <p>Completion and publication of the research work.</p> <p>Further details can be found on the Born in Bradford website<sup>7</sup></p>
<p><b>Highways Management &amp; Transport</b></p>	<p>£400k secured through Clean Vehicle Technology Fund (CVTF, DfT, 2014/15) to retrofit 26 Euro III commercial, diesel buses with selective catalytic reduction and particle traps (SCRT) in 2015 (in partnership with First Bus and Transdev)<sup>8</sup></p> <p>Continued retrofitting of 165 Euro III school buses across West Yorkshire in partnership with West Yorkshire Combined Authority (WYCA) Using Clean Bus/Vehicle Technology Fund (DfT)<sup>9</sup></p> <p>Real-world emissions testing of buses evidenced that retrofits achieved 95% reduction in NOx emissions</p> <p>Car club introduction in Bradford during 2015 (including an electric vehicle). Enterprise Car Club<sup>10</sup></p> <p>Continued progress with development of £19 million Cycle Super-Highway (Bradford-Leeds) separated cycle lane.</p> <p>West Yorkshire’s first new railway station in ten years</p>	<p>Partnership work with First Bus to encourage minimum Euro IV Standard for commercial buses from 2018 with further improved standards for 2020 and beyond. First operate 86% of commercial bus routes In Bradford</p> <p>Produce Bradford Council Travel Plan</p> <p>Opening of Cycle Super-Highway due summer 2016</p> <p>Progression of plans for a new railway station at Low Moor.</p>

<sup>6</sup> <https://www.bradford.gov.uk/media/1384/reportofthelezfeasibilitystudy.pdf>

<sup>7</sup> <http://www.borninbradford.nhs.uk/parents-families/Our-Findings-in-a-Nutshell/Air-Pollution-The-Magical-Power-of-Nature/>

<sup>8</sup> [http://www.thetelegraphandargus.co.uk/news/11466565.Government\\_grant\\_allows\\_green\\_makeover\\_of\\_most\\_polluting\\_buses/](http://www.thetelegraphandargus.co.uk/news/11466565.Government_grant_allows_green_makeover_of_most_polluting_buses/)

<sup>9</sup> <http://www.westyorks-ca.gov.uk/News/Articles/AccessBuses-go-green/>

<sup>10</sup> <https://www.enterpriseclub.co.uk>

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	opened at Apperley Bridge in Bradford in December 2015.	
<b>Development Control</b>	<p>Co-ordination of policies to limit the impact of biomass CHP installations in the urban area</p> <p>Continued implementation of Bradford LES low emission planning policies to ensure emission mitigation measures are implemented at the design stage, including the consideration of damage costs for major schemes. Required measures include:</p> <ul style="list-style-type: none"> <li>• Plug-in vehicle recharging on all schemes where practical – by the end of 2015 in the region of 4,000 charging points had been secured on new development schemes (since policy adoption in 2013)</li> <li>• Low Emission Strategies/fleet emission standards on commercial schemes</li> <li>• Monitored travel plans on all qualifying schemes</li> <li>• Electric vehicle provision</li> <li>• Cycle lanes and infrastructure for walking</li> </ul>	<p>Bradford LES planning guidance to be incorporated into West Yorkshire Low Emission Strategy (WYLES) – Air Quality &amp; Emissions: Technical Planning Guidance</p> <p>Ongoing routine review of planning applications and requests for LES planning measures</p> <p>Defra grant bid to secure funding for 'try &amp; buy' EV demonstration projects on EV ready development sites</p> <p>Inclusion of low NO<sub>x</sub> boiler requirement and the updating of commercial fleet standards through development control in Bradford LES update 2017</p>
<b>Bradford Council Fleet Management</b>	<p>Measures introduced / completed :</p> <ul style="list-style-type: none"> <li>• Whole life costs considered in vehicle purchasing</li> <li>• Hybrid electric cars, electric pool cars and vans incorporated into council fleet</li> <li>• Feasibility study of introducing gas/biomethane infrastructure for Refuse collection vehicles (RCV) fleet</li> <li>• Monthly fuel reports for client departments</li> </ul>	<p>Assessment of City of Bradford MDC fleet under Eco-stars fleet recognition scheme</p> <p>Continued aspiration to have 80% of City of Bradford MDC Euro VI/6 in 2020</p>
<b>Procurement</b>	<p>Vehicle emission assessment matrix developed and incorporated into all relevant tender evaluations through Social Value procurement policy</p> <p>Vehicle emission standards accorded 5% of evaluation score for relevant contract awards</p>	<p>Ongoing application of vehicle emissions procurement standards in line WY procurement guidance</p>
<b>Taxi Licensing</b>	<p>Ultra-Low Emission Taxi Study as part of OLEV funded EST study across West Yorkshire undertaken in 2015</p> <p>Measures include consideration of new West Yorkshire wide emission standards integrated into the taxi licensing system</p>	<p>Ongoing consideration of Infrastructure and incentives needed to promote uptake of plug-in taxis in Bradford.</p> <p>Submission of applications for grants to fund the support of operation of plug-in taxis in</p>

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		Bradford
<b>Freight &amp; logistics</b>	<p>Measures to improve vehicle emissions include:</p> <ul style="list-style-type: none"> <li>• Funding obtained to support set up of an Eco Stars fleet recognition scheme in West Yorkshire</li> <li>• Continued consideration of vehicle emissions through Social Value public procurement</li> <li>• Continued requirement for fleet standards on some new commercial development schemes</li> </ul>	<p>Launch of Eco-stars fleet recognition scheme in Bradford</p> <p>Continued implementation of fleet procurement and low emission planning fleet requirements</p>

## Local Priorities and Challenges

Bradford has areas of high levels of deprivation and significant levels of health inequality. 45% of the Bradford district population live in areas classed as the 20% most deprived in England. There are above average numbers of deaths from smoking, cancer, heart disease, strokes and it is estimated that man-made fine particles PM<sub>2.5</sub> cause the equivalent of 222 adult deaths a year in Bradford, representing 5.3% of total mortality.

Improving public health outcomes and the reduction of deprivation are significant challenges. Poor air quality is closely linked to poor health, and frequently identified in the most deprived wards of the city. Bradford MDC fully recognises that improving local air quality is an essential to attain better health outcomes for all. This is particularly important for the above national average numbers of young people in the district (22% of the total population) whom are particularly sensitive to the impacts of poor air quality. They may experience life long impacts resulting from pollutant exposure in their early years.

Some of the key challenges to improving air quality in Bradford are:

- Failure of vehicle manufacturers to reduce emissions from vehicles as quickly as was previously anticipated. This is considered to be a direct result of inadequate emission control tests for new vehicles and the ability of manufacturers to employ mechanisms that delivered unachievable emission figures under normal driving conditions. Consequently 'on the road emissions' of NO<sub>x</sub> from many modern vehicles, particularly Euro 5 diesel cars, are much higher than consumers were led to believe.
- The increased uptake of diesel vehicles in the general vehicle fleet, driven by central government taxation policies designed to encourage the purchase of new diesel vehicles
- Development related "emissions creep", arising from new vehicle trips linked to development in the city and additional combustion sources such as heating and industry.

The above factors are considered to be significant causes of the continued existence elevated levels of NO<sub>2</sub> concentrations in Bradford.

## Moving forward

Over the next year the City of Bradford MDC will continue to implement key air quality improvement measures in the Bradford LES and WYLES as detailed in Table 1. Further investigations will be undertaken in the areas of air quality concern outlined previously and the declaration of the AQMA at Saltaire Road / Bradford Road initiated.

In December 2015 plans were announced for the establishment of mandatory Clean Air Zones (CAZs) in five English cities by 2020, including our neighbouring authority, Leeds. Although Bradford was not included in this initial list of cities it is considered that Bradford may be required to introduce a mandatory CAZ at a later date.

As part of the continued update of the Bradford LES, the introduction of a voluntary Clean Air Zone (CAZ) in Bradford will be considered. This will incorporate the findings of a previous West Yorkshire Low Emission Zone (LEZ) feasibility study and the likely implications that the presence of a CAZ in neighbouring Leeds will have on future vehicle emission standards within Bradford. The West Yorkshire LEZ study concluded that considerable health benefits could be achieved by reducing emissions from diesel vehicles in Bradford and that tackling emissions from diesel buses should be a key priority of a future strategy. Currently all private cars fall outside the scope of any proposed CAZ controls in the UK.

Until any further local decision is made on the implementation of a voluntary CAZ, the current programme of bus retrofits will be pursued. Bradford Council will also continue to work with local bus operators in order to achieve a voluntary minimum emission standard for the majority of buses that operate within the Bradford district (currently working towards a minimum Euro IV plus retrofit standard).

If Bradford is subsequently advised that it must implement a mandatory CAZ, the current approach to air quality improvement in Bradford (and the level of resource currently available for this work) would require a full review. Any detailed CAZ proposals would then be subject to a full public consultation process.

## How to get involved

In order to improve air quality in Bradford and reduce exposure to pollution, Bradford MDC advises residents to make simple changes to their everyday life;

- If able, reduce your vehicle use by walking and cycling for shorter journeys, highlighting the value for health and the environment. Consider using the 'walk it' app (<https://walkit.com/>) which helps plan journeys in Bradford (and other cities). Try and pick routes which are not as heavily trafficked (e.g. through parks and lesser used streets) to reduce the amount of pollution exposure.
- Make the most of public transport as an alternative to using a car, this can save money and reduce impact on the environment. Check out the information on the Council website for local transport provision and see if it can help better plan journeys - <https://www.bradford.gov.uk/transport-and-travel/public-transport/public-transport/>
- If you have children who are travelling to school consider the advice on the Council website to help make this journey more sustainable and improve their health ; <https://www.bradford.gov.uk/education-and-skills/travel-assistance/sustainable-travel-to-school/>
- Think about how homes are heated and to ensure compliance with the legal requirements for smokeless zones. Residents are advised that if they fail to comply they could risk a fine of up to £1,000 per offence <https://www.google.co.uk/#q=defra+smoke+control+areas>)
- If you live in an urban area, consider buying a 'low nitrogen oxide' boiler the next time it requires replacement.
- If you own a vehicle which is regularly driven in urban areas, think about the impact on the environment when the time comes to replace it. Low emission vehicles (tax band A and B) are usually better environmental options for urban driving and even older petrol vehicles are less polluting in most cases than diesel vehicles. Consider low emission alternatives, such as hybrids and electric vehicles, although the initial purchase price may seem high in the longer term they may prove more cost effective through reduced fuel and tax

costs. Government grants are available to help with the purchase of some low emission vehicles. <https://www.gov.uk/plug-in-car-van-grants/eligibility>

Whatever vehicle you drive the Council encourages drivers to try and follow the green driving tips below;

### Green driving tips

- **Lift-Share**

Check if it is possible to share your vehicle or take a lift to reduce the impact of journeys. Consider using the West Yorkshire lift share website to help with this; <https://wy.liftshare.com/>

- **Check your tyres**

Under-inflated tyres mean an engine has to work harder and will produce more emissions.

- **Clear the clutter**

Remove unnecessary clutter from your boot and reduce engine workload.

- **Stick to the speed limit**

High speeds produce more emissions. At 70mph a driver could be using up to 15 per cent more fuel than at 50mph.

- **Slow down as you approach traffic jams**

Stop-start traffic jams use more fuel. Slow down early and take your foot off the accelerator.

- **Don't over-rev**

Changing up a gear early can reduce revs. For diesel cars change up when the rev counter reaches 2000rpm. For petrol cars, change up at 2500rpm.

- **Switch off your engine**

If likely to be at a standstill for more than three minutes switch off your engine.

- **Close windows**

Keeping windows closed at higher speeds will use less fuel.

- **Cut down on air-conditioning**

Air-conditioning increases fuel consumption and produces more emissions.

If you would like to see more done to improve air quality in your area then you could contact the local Councillor or MP and tell them about your concerns or ideas.

To find out who your local Councillor or MP is and how to contact them;

<https://bradford.moderngov.co.uk/mgMemberIndex.aspx?bcr=1>

<http://www.parliament.uk/mps-lords-and-offices/mps/>

For more information on national campaigns to improve air quality and opportunities to undertake your own monitoring visit;

- <https://www.foe.co.uk/page/air-pollution-campaign-clean-air>
- <http://www.clientearth.org/>
- <http://cleanair.london/>

Daily national air quality updates, pollution forecasts and advice about how to protect yourself from the impacts of poor air quality can be found at:

- <https://uk-air.defra.gov.uk/>

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# 1 Local Air Quality Management

This report provides an overview of 2015 air quality in Bradford. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether the air quality objectives are likely to be achieved. Where an exceedance is identified the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP), setting out the measures to be put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement detailing the strategies employed by the City of Bradford MDC to improve air quality and the progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

## Actions to Improve Air Quality

### 1.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance, or likely exceedance, of an air quality objective. Within 12-18 months of declaration, the authority must prepare an Air Quality Action Plan (AQAP) detailing the measures it intends to implement in pursuit of the objectives.

A summary of AQMAs declared by the City of Bradford MDC can be found in Table 1.1. Further information relating to air quality in Bradford can be found at:

<https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/>

Maps of the current AQMAs can be found in the Executive summary at the beginning of this report.

As a consequence of the data presented in this report, we propose to declare a new AQMA around the Saltaire Road / Bradford Road junction and to carry out further monitoring of the situation around Harrogate Road / Killinghall/Dudley Hill Road and

Rooley Avenue /Rook Lane and Tong Lane. A decision on AQMA declarations in the latter two areas will be given in future ASR submissions.

**Table 1.1 – Declared Air Quality Management Areas**

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Mayo Avenue / Manchester Road (order 1)	NO <sub>2</sub> annual mean NO <sub>2</sub> hourly objective	Bradford	Several areas of terrace housing located adjacent to the junction of Mayo Avenue and Manchester Road.	Measures to improve air quality in this area are currently being pursued through the measures set out in the Bradford LES
Manningham Lane / Queens Road (order 2)	NO <sub>2</sub> annual mean NO <sub>2</sub> hourly objective	Bradford	Mixed housing (predominately terraced) located adjacent to junction of Manningham Lane and Queens Road	Measures to improve air quality in this area are currently being pursued through the measures set out in the Bradford LES
Thornton Road (order 3)	NO <sub>2</sub> annual mean NO <sub>2</sub> hourly objective	Bradford	Small area of mainly student housing located adjacent to Thornton Road	Measures to improve air quality in this area are currently being pursued through the measures set out in the Bradford LES
Shipley Airedale Road (Order 4)	NO <sub>2</sub> annual mean NO <sub>2</sub> hourly objective	Bradford	Small amount of housing (mainly apartments in a former mill building) located adjacent to Shipley Airedale Road	Measures to improve air quality in this area are currently being pursued through the measures set out in the Bradford LES

## 1.2 Progress and Impact of Measures to address Air Quality in Bradford

The City of Bradford MDC has pursued a number of measures during 2015 to improve local air quality. Details of all measures completed, in progress or planned are detailed in Table 1.2. Further detail on these measures can be found in the Bradford Low Emission Strategy and the draft West Yorkshire Low Emission Strategy.

A detailed summary table of the measures undertaken and planned for the Bradford district is detailed in the Executive summary section (Table 1).

The main measures progressed during 2015 were:

- Reporting of the outcomes of the Low Emission Zone feasibility study to Elected Members with a decision to consider the feasibility of implementation in Bradford
- Public consultation undertaken on the West Yorkshire Low Emission Strategy (due for final publication in 2016)
- Retrofitting of 26 Euro III diesel buses with SCRT and particle traps
- Car club initiated in Bradford
- Continued construction of the £19 million cycle super highway (to be opened in summer 2016)
- Continued implementation of LES planning measures, resulting in over 4000 EV charging points conditioned in the district since the guidance was introduced
- The opening of West Yorkshire's first new railway station in 10 years at Apperley Bridge in Bradford in December 2015
- Funding obtained for West Yorkshire Eco-stars scheme (to be launched in 2016)
- Development of Health Impact Assessment (HIA) methodology and toolkit in conjunction with Bradford NHS Improvement Academy and University of York
- Undertaking of a school travel project and associated toolkit in conjunction with Born in Bradford 'Better Start' project

The City of Bradford's priorities for the coming year are:

- Completion and formal adoption of the WYLES in Bradford and by our partners across the rest of West Yorkshire
- Commencement of a review and subsequent update of the Bradford LES
- Publishing of academic papers in relation to the HIA and school travel research projects
- Continued progress with bus retrofit schemes and to secure an agreement with bus operators on a voluntary minimum bus emission standard for the Bradford area

- Publishing of the Bradford Travel Plan
- Opening of the cycle super-highway
- Launching the West Yorkshire Eco-stars scheme
- Undertaking a Ultra-Low Emission taxi study
- Further consideration of the need for a voluntary CAZ in Bradford

**Table 1.2 – Progress on Measures to Improve Air Quality**

This table details the measures currently being undertaken in Bradford to improve air quality as driven by the Bradford LES and the WYLES. These two documents supersede the previous Air Quality Action Plans previously published for Bradford, which have now been delivered in full or where still required, incorporated into the Bradford LES / WYLES. The table presents the situation as of the end of 2015. A further update on progress will be provided in the 2017 ASR report.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Ongoing implementation and review of the Bradford LES	Policy guidance and development	Low Emissions Strategy	City of Bradford MDC	completed	Adopted November 2013	Complete update and review of Bradford LES by summer 2017	Emissions from all existing and new sources to be reduced as far as practically possible using measures within the Bradford LES	Good	Ongoing delivery and review process	All the additional measures detailed below contribute to the delivery of the Bradford LES and are subject to ongoing review and development. The Bradford LES is currently being updated to incorporate WYLES measures and target dates.
2	Adoption of West Yorkshire Low Emission Strategy	Policy guidance and development	Low Emissions Strategy	City of Bradford MDC	completed	Consultation and formal adoption to take place in 2016	Adoption of WYLES by City of Bradford MDC by end of 2016	Emissions from all existing and new sources to be reduced as far as practically possible across the West Yorkshire region using measures within the final WYLES	Good	Final adoption by end of 2016 followed by ongoing delivery and review	The development of WYLES has been lead by City of Bradford MDC. Many of the ideas and concepts within it have their origins within the Bradford LES

## City of Bradford MDC

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
3	Low emission planning guidance	Policy guidance and development	Air quality planning and policy guidance	City of Bradford MDC	completed	Adopted November 2013	Number of EV charging points delivered on new developments	Emissions from all new developments to be reduced as far as practically possible and opportunities for increased exposure to air pollution minimised	LES planning guidance now routinely applied to all planning applications	Ongoing delivery and review needed	Since implementation the LES planning guidance has resulted in the conditioning of over 4000 EV charging points on new developments and numerous other low emission infrastructure and low emission fleet measures. The Bradford LES planning policy will be reviewed again once the wider WYLES planning policy has been fully adopted.
4	LEZ feasibility study	Promoting low emission transport	Low Emission Zone (LEZ)	City of Bradford MDC in conjunction with other partners	Completed	LEZ feasibility study was completed and reported to Elected Members in 2015 with a Council decision to consider the feasibility of the implementation of LEZ in Bradford	No date set yet for completion of implementation study	The LEZ feasibility study indicated that an LEZ could reduce NOx emissions within the Outer Ring Road by 195.8 tonnes.	Awaiting steer from Members on next steps.	Ongoing	Following an announcement from Defra on mandatory CAZs in 2015 and ongoing legal action with respect to the National Air Quality Action Plan, Bradford MDC is currently awaiting clarification on future CAZ requirements before progressing the outcome of the LEZ feasibility study.
5	WYLES procurement guidance	Promoting Low Emission Transport	Fleet efficiency and recognition schemes	City of Bradford MDC in conjunction with other partners	Completed	WYLES 2016-2021	Low emission procurement contracts	Emissions in relation to all new procurement contracts to be reduced as far as practically possible. Operators to be rewarded for LEV practices	LEV procurement policy 5% of award decision as part procurement policy (social values)	Ongoing	All procurement decisions (including delivery of goods and services) with a transport or heating impact to be considered in relation to the emissions matrix.
6	Identifying the barriers to walking to school	Promoting travel alternatives	School travel plans	City of Bradford MDC / Born in Bradford	Completed	Development will continue throughout 2017	Development of school travel plan toolkit by Dec 2017	Reduction of pollution in all areas in particular around school gates and playgrounds	Ongoing	Dec 2017	This work is being completed in partnership with Born In Bradford and the Bradford Institute of Health Research (NHS)

## City of Bradford MDC

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
7	Bus retrofit projects	Vehicle Fleet efficiency	Vehicle retrofitting projects	City of Bradford MDC	Completed	Completed	25 buses successfully retrofitted, 11 in the City Centre and 14 on Manningham Lane	Real-world emission (PEMS) testing of buses showed that retrofits achieved 95% reduction in NOx emissions. Improvements in air quality in manningham Lane	Completed	Completed	This was possible due to a successful grant application for £400,000 to the CVTF fund, supported by figures from the LEZ study. Future projects will source alternative funding streams where available and operators will be encouraged to invest in cleaner fleets themselves.
8	Car Club	Alternatives to private vehicle use	Car Clubs	City of Bradford MDC	Completed 2014	Completed 2015	Number of registered car club users	Not quantified	Scheme operational.	Completed	Further car clubs / car club vehicles will be introduced in the district as demand increases. Planning measures being used to promote introduction on new housing schemes.
9	Cycle Super Highway	Transport Planning and Infrastructure	Cycle network	City of Bradford MDC	Completed	Construction in progress during 2015	Not yet identified	Not quantified	Scheme under construction	Summer 2016	
10	Staff Travel Plan	Promoting travel alternatives	Workplace Travel Plan	City of Bradford MDC	Ongoing	To be fully adopted in 2016	Not yet identified	Not quantified	Development phase	Summer 2016	Travel plan hierarchy promotes bus/rail and ULEV car club vehicles for business trips.
11	ECO - stars recognition scheme	Vehicle fleet efficiency	Fleet efficiency and recognition schemes	WYLES steering group City of Bradford MDC	Ongoing	To be implemented in 2016	Number of Bradford fleets joining the scheme	Not quantified	Funding obtained and contractor appointed	December 2016	The introduction of a West Yorkshire fleet recognition scheme is a measure in the WYLES. Funding to support the scheme has been obtained from the West Yorkshire Combined Authority.

## City of Bradford MDC

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
12	Low emission procurement policies for City of Bradford MDC fleet vehicles	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	City of Bradford MDC	complete	Ongoing	Implementation of WYLES procurement guidance	Not quantified	Reduction of 332 t/CO2e 2014/15 – 2015/16. 7 electric vans and 2 electric pool cars with 3 additional charging stations.	Ongoing application and review of policy needed	Introduction of Whole Life costs into vehicle procurement considerations including air quality damage costs
13	Voluntary emission standard for buses	Promoting Low Emission Transport	Other	City of Bradford MDC / Bus operators	WYLES key objective	By 2018	Euro IV plus retrofit By 2018	24.7 tonnes of NOx	Progressed through Bus 18 programme with operators	End of 2018	City of Bradford MDC and WYCA have entered into negotiations with local bus operators to try to achieve a minimum Euro IV emission standard for the majority of buses used in Bradford by 2020.
14	Delivery of new railway stations	Transport planning and infrastructure	Public transport improvements- interchanges stations and services	WYCA	Apperley Bridge Completed Low Moor in progress	Completed Not started	Passenger numbers	Not quantified	Station open Still in planning phase	Completed Unknown	The new station at Apperley Bridge provides two trains per hour serving on the route from Leeds to Bradford Foster Square / Keighley. This will help to remove car trips from the main road network in Bradford.
15	Encouraging uptake of low emission taxis	Promoting Low Emission Transport	Taxi emission incentives Taxi licensing conditions	City of Bradford MDC	Ongoing	In discussion	WY Low emission taxi licensing policy	Not quantified	Ultra-Low Emission Taxi Study as part of OLEV funded EST study across West Yorkshire undertaken in 2015	Ongoing	OLEV study has provided detailed information about the current taxi fleet and identified where emission reduction opportunities exist. City of Bradford MDC is currently considering the feasibility of implementing various measures for reducing taxi emissions and how they might be funded

## City of Bradford MDC

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
16	Public awareness	Public information	Via other mechanisms	City of Bradford MDC/NHS	2015	2016	No of signatories	N/A	Ongoing	Ongoing	Raising public awareness through the use of street infographics and air quality and health online petition in partnerships with Doctors and academics at Univ of Leeds.
17	Health and air quality economics	Public information	Via other mechanisms	City of Bradford MDC/NHS	2015	2016	Toolkit development and workshop to share with stakeholders	Policy influence	Uptake ongoing	Ongoing	Development of the Captor toolkit and published papers to quantify the health impact of Low Emission Policy change, in partnership with NHS and health economics experts at Univ York.
18	Identifying the barriers to Low Emission Policy change	Public information	Via other mechanisms	City of Bradford MDC/NHS	2016	2017-18	Published papers	Policy influence	Ongoing	2018	Project to identify the barriers to policy change in partnership with NHS and Univ Leeds PHD student. Qualitative interviews with key policy makers and subsequent analysis
19	Public Health reporting of Air Quality	Public information	Via other mechanisms	City of Bradford MDC/NHS	2016	Ongoing	Air quality in key Council documents	Policy Influence	Ongoing	Ongoing	Air quality in the JSNA, directors PH report, Health and Well being strategy and Strategic Transformation Plan for the area. Raising the profile of air quality and reporting to the Health and Well being Board

### 1.3 PM<sub>2.5</sub> – Local Authority Approach to Reducing Emissions and or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of PM<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and increased incidence of cardiovascular diseases.

In Bradford, emissions of man-made fine particles PM<sub>2.5</sub> are estimated to cause 222 adult deaths a year in Bradford, representing 5.3% of total mortality. Road transport emissions are the most significant source of fine particulates, leading to exceedances, but locally elevated concentrations can also arise from biomass combustion, heating, industry and wind blown dust. The World Health Organisation (WHO) classifies diesel exhaust emissions as carcinogenic.

No areas within the Bradford district are considered likely to exceed the EU Limit Value for PM<sub>2.5</sub> (annual average concentration of 25µg/m<sup>3</sup>) but there are areas, near to major roads, experiencing concentrations of PM<sub>2.5</sub> which exceed the recommended World Health Organisation (WHO) Target Level of 10µg/m<sup>3</sup>.

There are marked differences in people's health within the Bradford district indicating significant health inequalities exist. For example, people living in Wharfedale to the north of the district typically live five years longer than people living in Tong in the south. Similarly, when the Bradford district is compared to the rest of the country, people's average life expectancy is reduced. In Bradford there are more deaths as a result of smoking, cancer, heart disease, and strokes, and higher rates of mortality in children, than in many other cities. Through research carried out by environmental epidemiologists at the Bradford Institute of Health Research (BIHR) many of these illnesses have been proven to have direct linkages to air pollution exposure at a local level

Within the City of Bradford MDC, air quality and public health specialists work closely together to deliver the key outcomes in the Bradford LES and the WYLES (as detailed in Tables 1 and 1.2). They are supported in this by colleagues from other Council Departments such as transport, planning, highways, fleet management and procurement.

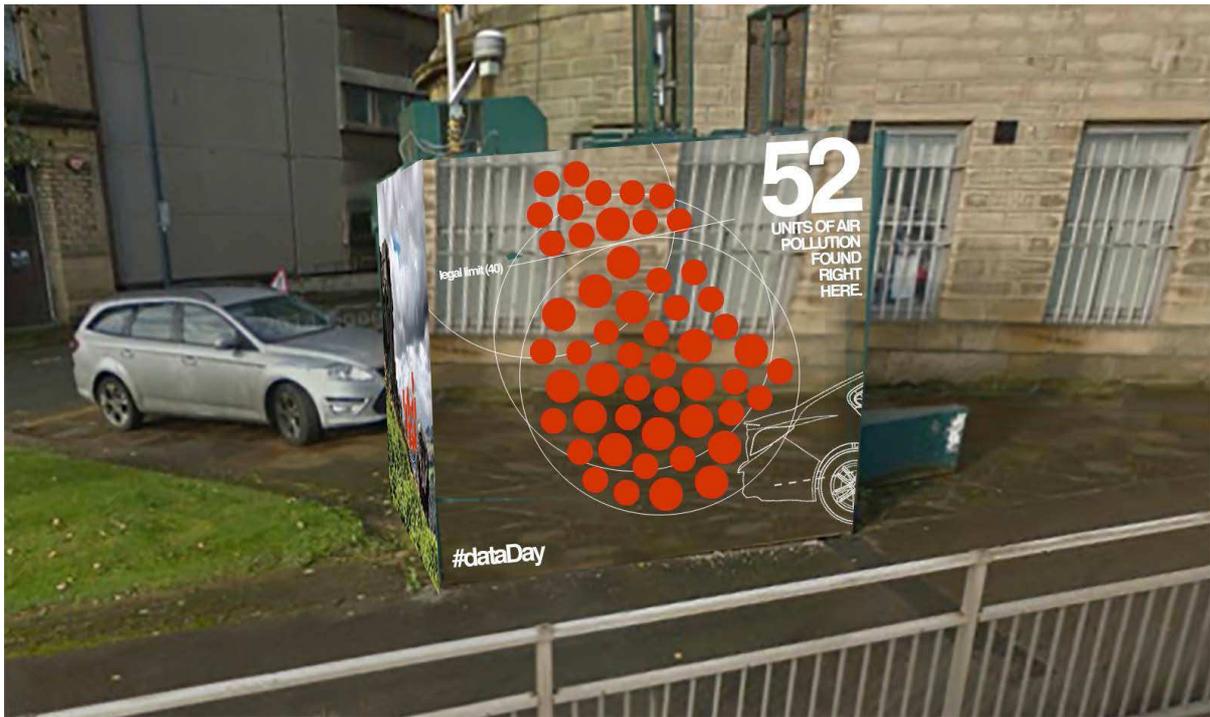
Delivery of the LES and WYLES will result in reduced exposure to all types of air pollutants, including PM<sub>2.5</sub> so there is no requirement for additional PM<sub>2.5</sub> reduction measures in Bradford at the present time. The LES and WYLES measures aimed at reducing emissions from diesel vehicles and biomass boilers will be the most effective at reducing PM<sub>2.5</sub> as these are the main sources of this pollutant in Bradford.

Within Bradford there is a strong emphasis on improving the understanding of how air pollution impacts on health, and consequently effectively communicating this to other professionals and members of the public.

The Public Health Department has funded the introduction of PM<sub>2.5</sub> monitoring at three of the existing air pollution stations (Bingley, Keighley and Shipley Airedale Road). The results from this monitoring are being used to inform major research programmes (such as the 'Born in Bradford (BiB)' and 'Helix' project) and are being pro-actively communicated to members of the public using striking and informative infographics on air pollution stations (developed in conjunction with Dr Catherine Stone at Leeds University) – see figure 3

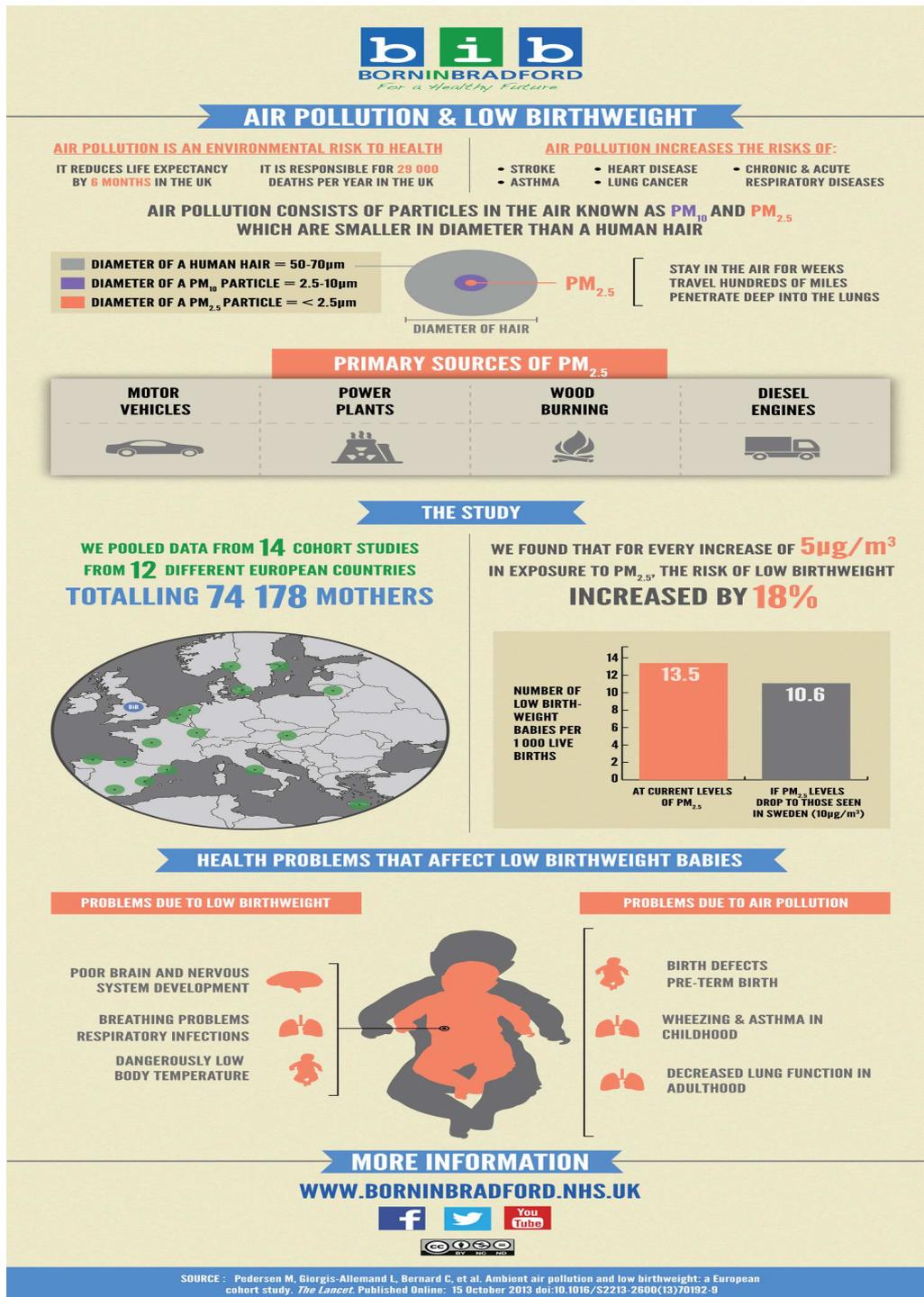
Born in Bradford is one of the largest and most important medical research studies currently being undertaken in the UK. It is tracking the lives of 13,500 Bradford born babies (and their families) to ascertain more about the causes of childhood illness. The work has already identified a number of important linkages between air pollution exposure and health as detailed in the infographic below (figure 4).

Figure 3: Communication of air quality information



*Infographics produced by Dr Catherine Stone, University of Leeds*

Figure 4: Outcomes from BiB study



## 2 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

### 2.1 Summary of Monitoring Undertaken

Monitoring is undertaken in Bradford using a mix of real time automatic monitoring sites and passive diffusion tube samplers. The majority of the long term ambient air quality monitoring is located in urban areas of the district and is specifically aimed at monitoring traffic pollution. Additional diffusion tubes are added to the network (as and when required) to monitor pollution in areas where new development is proposed, or has recently taken place. Diffusion tubes are also used to assess conditions before, and after, the installation of major new heat and energy plants, particularly those fuelled by biomass or waste products.

The majority of the monitoring equipment operated in Bradford is owned and operated by Bradford MDC. The Mayo Avenue automatic monitoring site was affiliated to the national AURN monitoring network during 2015. Results from this site can now be viewed at <http://uk-air.defra.gov.uk/networks/network-info?view=aurn>.

#### 2.1.1 Automatic Monitoring Sites

City of Bradford MDC undertook automatic (continuous) monitoring at 7 sites during 2015 as follows:

CM1 – Bingley (urban background)

CM2 – Keighley (urban centre)

CM3 – Manningham Lane - roadside AQMA

CM4 – Mayo Avenue – roadside AQMA (affiliated to AURN network during 2015)

CM5 – Thornton Road – roadside AQMA

CM6 – Shipley Airedale Road - roadside AQMA

CM7 – Rook Lane - detailed assessment monitoring

Site CM1 is due to be relocated from Bingley (urban background) to Tong Street (roadside site) to assist with the undertaking of a detailed assessment in that area.

The approximate locations of the real time monitoring sites are shown in figure 5. Table A.1 in Appendix A gives further details of the sites.

**Figure 5: Map of Automatic Monitoring Sites operational during 2015**



Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate that there is a problem. National monitoring results are available at

<https://uk-air.defra.gov.uk/latest/>

Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

### 2.1.2 Non-Automatic Monitoring Sites

The City of Bradford MDC undertook non- automatic (passive) monitoring of NO<sub>2</sub> at 34 sites during 2015. Table A.2 in Appendix A presents the details of the sites.

Maps showing the location of the non-automatic monitoring sites are provided in Appendix D.

Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

## 2.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for “annualisation” and bias. Further details on adjustments are provided in Appendix C.

### 2.2.1 Nitrogen Dioxide (NO<sub>2</sub>)

#### Compliance with NO<sub>2</sub> annual mean objective (AQMA)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past 5 years with the air quality objective of 40µg/m<sup>3</sup>.

For diffusion tubes, the full dataset of monthly mean values is provided in Appendix B.

The automatic monitoring results indicate that during 2015 the annual average nitrogen dioxide objective was breached in the following AQMA:

- Mayo Avenue
- Manningham Lane
- Shipley Airedale Road

For the first time in five years, no exceedance of the annual average NO<sub>2</sub> objective was observed in the Thornton Road area during 2015. Monitoring is continuing at this location and the situation will be re-assessed in future ASR reports. If levels remain below the objective level for a further year then consideration may be given to revoking this AQMA.

The annual average NO<sub>2</sub> concentration recorded at Shipley Airedale Road in 2015 was lower than any other recorded in the previous five years. There is some evidence of a long term improvement in air quality at this location, but levels remain above the annual average objective level and monitoring is being continued.

At Mayo Avenue the level recorded in 2015 (42µg/m<sup>3</sup>) was the same as that measured in 2014. This is a large reduction compared to levels identified in earlier years of monitoring (which regularly exceeded 70 µg/m<sup>3</sup>). It would appear that there has been an improvement in the air quality at this location in the last two years.

Due to historic problems with the analyser at Manningham Lane there is insufficient data to provide comment on long term trends. Additional diffusion tube data has recently been installed in order to provide a better understanding of current annual average NO<sub>2</sub> concentrations in this area. As discussed below, the additional tubes have identified that the Manningham Lane AQMA needs to remain in place for the foreseeable future.

Background levels of NO<sub>2</sub> at Bingley and Keighley have remained stable over the previous 5 years with no emerging evidence of a long term upward or downward trend.

**Figure 6 Trends in annual average NO<sub>2</sub> concentration measured at continuous monitoring sites**

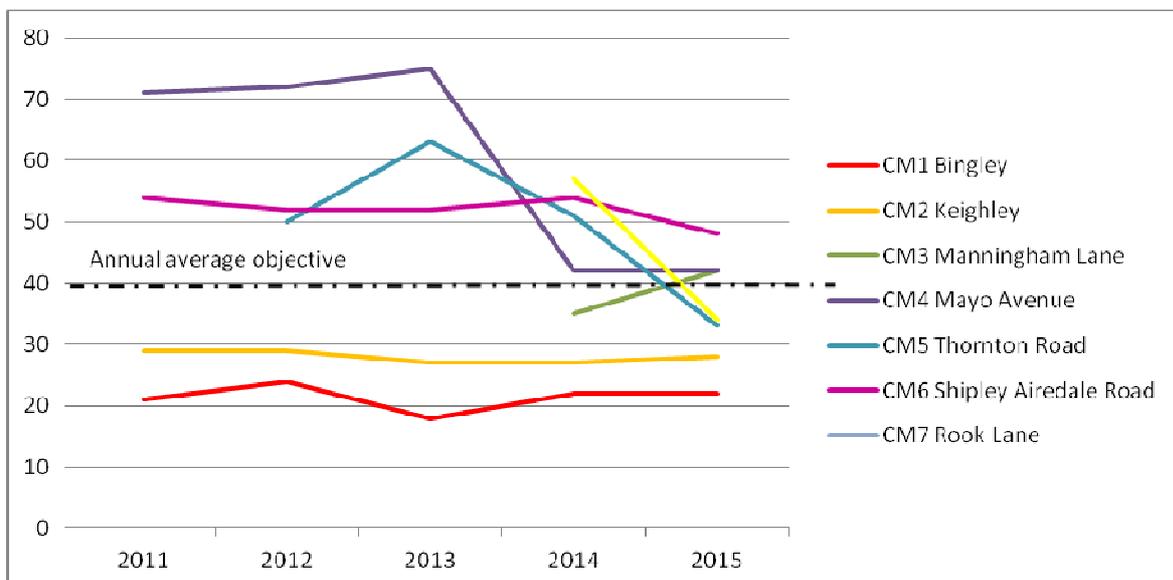


Table 3.1 summarises the distance corrected annual means for those diffusion tube sites which are located close to relevant receptors and had annual means in excess of  $40 \mu\text{g}/\text{m}^3$  in 2015. The distance corrected figures are representative of exposure at the nearest sensitive receptor.

As can be seen from Table 3.1 the diffusion tubes in the Manningham Lane AQMA (DT71 and DT72) also indicate that the annual average objective for nitrogen dioxide was breached in this location. There is a high degree of correlation between the annual average  $\text{NO}_2$  result obtained from the real time site ( $42 \mu\text{g}/\text{m}^3$ ) and the nearest diffusion tube (DT71 =  $40 \mu\text{g}/\text{m}^3$ ). Concentrations on Queen Street (also within the AQMA) appear to be higher than those at the real time monitoring site.

Diffusion tube DT12 is located close to the real time monitoring site on Shipley Airedale Road. Similar to the real time monitoring site, the tube data also indicates a continued breach of the annual average  $\text{NO}_2$  objective within this AQMA.

### **Compliance with $\text{NO}_2$ hourly objective (AQMA)**

Table A.4 in Appendix A compares the ratified continuous monitored  $\text{NO}_2$  hourly mean concentrations for the past 5 years with the air quality objective of  $200 \mu\text{g}/\text{m}^3$ , which is not to be exceeded more than 18 times per year.

During 2015 there were no exceedances of the  $\text{NO}_2$  hourly objective at any of the continuous monitoring sites in Bradford. This is an improvement on previous years when there have always been exceedances at one or more of the sites.

The diffusion tube monitoring undertaken in 2015 identified one site (DT12) as having an annual average concentration  $>60 \mu\text{g}/\text{m}^3$ . An annual average concentration of  $>60 \mu\text{g}/\text{m}^3$  measured using a diffusion tube can be indicative of a location where the hourly objective may be exceeded. This particular site (DT12) is located very close to the continuous analyser on Shipley Airedale Road. As detailed above there were no breaches of the hourly objective recorded at this site so this is not of concern.

### Compliance with NO<sub>2</sub> objectives (outside current AQMAs)

In the 2015 USA report three areas of the city were identified as requiring further investigation prior to possible AQMA declarations. These were:

- Saltaire Road / Bradford Road junction
- Rook Lane / Rooley Lane / Tong Street area
- Harrogate Road / Killinghall Road/ Dudley Hill Road crossroads

### Current situation Harrogate Road / Killinghall junction

The 2015 diffusion tube monitoring data has not identified any breaches of the annual average objective within the Harrogate Road / Killinghall junction during 2015. However, the distance corrected result for results for D42 (Killinghall) was 40 µg/m<sup>3</sup> and requires ongoing surveillance. A decision will be taken whether to proceed with the declaration of an AQMA in this area following completion of the 2017 ASR report.

### Current situation Saltaire Road / Bradford Road junction

Tubes in the Saltaire Road / Bradford Road area have continued to show breaches of the annual average NO<sub>2</sub> objective during 2015. Bradford MDC will now implement steps to include this area within a further AQMA declaration. Details of the process to achieve this will be included in the 2017 ASR report.

### Current situation Rook Lane / Rooley Avenue /Tong Street area

Tubes in the Rook Lane / Rooley Avenue / Tong Street area have provided a mixed picture during 2015. Exceedances of the annual average objective were recorded at tube D77 (Rooley Avenue) but levels at the real time monitoring site and closer to Tong Street were lower than those seen in previous years and below the annual average objective level. A new real time monitoring site and additional diffusion tube locations are to be established in this area. Bradford MDC proposes to obtain further information from these sites before determining if a declaration of a further AQMA is required in this area. An update will be provided in future ASR reports.

**Emerging areas of concern**

In response to planning applications in the area, diffusion tube monitoring sites were established in the Canal Road area of the city during 2015. The initial results from one of these sites DT73 indicates that the annual average NO<sub>2</sub> objective is already being breached in this area. This is prior to further approved development taking place. A further update on this area and the status of the planning applications will be provided in the 2017 ASR report. This is currently not a relevant location so does not presently require an AQMA declaration.

Table 3.1 Distance corrected concentrations for sites over 40µg/m<sup>3</sup> near relevant locations (2015)

Site I.D.	Description	Distance from kerb (m)	Distance to relevant exposure (m)	Measured annual average concentration (µg/m <sup>3</sup> ) 2015	Estimated annual average concentration at nearest relevant receptor	Is this area already an AQMA?
DT5	Harrogate Road (furthest from crossroads)	<0.5	1	40.2	36.7	No
DT42	Killinghall	1	2	44.7	39.7	No
DT12	Treadwell Mills	1.5	1.5	66.0	<b>59.3</b>	Yes
DT31	80 Bradford Rd, opp Hirst St	1.2	2	49.0	<b>43.5</b>	No
DT50	203 Bradford Road	1.5	4	55.6	<b>46.0</b>	No
DT71	Manningham Lane adj ST Nox unit	1.5	0	40.4	<b>40.4</b>	Yes
DT72	Queens Rd (traffic lights)	1.0	0	59.5	<b>59.5</b>	Yes
DT76	Junction of Rook Ln/Tong St	1.0	0	40.8	<b>40.8</b>	No
DT77	bus stop 535 Rooley Lane	1.0	0	50.8	<b>50.8</b>	No

## Implications for LEZ / CAZ proposals

The outcomes of the Bradford / Leeds Low Emission Zone study were reported to Elected Members in 2015 with a Council decision to consider the feasibility of implementing a LEZ in Bradford. This was followed by an announcement for plans to create statutory Clean Air Zones (CAZs) in five English cities, including neighbouring Leeds. The robustness of this proposal, and the content of the wider national air quality action plan, has been legally challenged at a national level. If this challenge is successful there is a possibility that Bradford may be required to introduce a future mandatory CAZ.

Any requirement to create a LEZ or CAZ in Bradford would require a complete review of the current Bradford LES and could significantly impact on the need to declare further AQMAs. Bradford will continue to work towards implementing the Saltaire Road / Bradford Road area as an AQMA, but a decision as to whether to declare the other areas of concern (which are closer to the city centre and more likely to be impacted on by a mandatory CAZ) will be taken when there is more clarity around future LEZ /CAZ policies in the city.

### 2.2.2 Particulate Matter (PM<sub>10</sub>)

#### Compliance with annual average objective

Table A.5 in Appendix A compares the ratified and adjusted monitored PM<sub>10</sub> annual mean concentrations for the previous 5 years with the air quality objective of 40µg/m<sup>3</sup>.

There were no exceedances of the annual average air quality objective for PM<sub>10</sub> recorded at any of the continuous monitoring sites in Bradford during 2015.

The background levels of PM<sub>10</sub> recorded at Bingley and Keighley were within the same range of values as those recorded over the previous 5 years. Some slight annual variation in concentration is expected due to the influence of weather conditions, but there is currently no evidence of any long term change in background concentrations of PM<sub>10</sub> within the Bradford district.

Long term trend data for the roadside PM<sub>10</sub> site is not available. Roadside monitoring of PM<sub>10</sub> was re-instated at Shipley Airedale Road during late August 2015. The results obtained for the period August 2015 to December 2015 have

been annualised against longer term PM<sub>10</sub> data for the area to account for expected seasonal variation. The annualised result indicates that the roadside concentration of PM<sub>10</sub> measured at the Shipley Airedale Road during 2015 was significantly lower than that previously recorded during 2011. An overall reduction of 10.4 µg/m<sup>3</sup>. Ongoing monitoring of PM<sub>10</sub> is now taking place at Shipley Airedale Road to determine if this is indicative of a longer term downward trend in roadside PM<sub>10</sub> concentrations in Bradford.

### **Compliance with daily mean objective**

Table A.6 in Appendix A compares the ratified continuous monitored PM<sub>10</sub> daily mean concentrations for the previous 5 years with the air quality objective of 50µg/m<sup>3</sup>, which is not to be exceeded more than 35 times per year.

At Keighley and Bingley there was only one day at each site which exceeded 50µg/m<sup>3</sup> during 2015. These were:

- 51.3 µg/m<sup>3</sup> recorded at Keighley on 4<sup>th</sup> October 2015
- 50.1 µg/m<sup>3</sup> recorded at Bingley on 18<sup>th</sup> March 2015

At the Shipley Airedale Road site there were two days between 21<sup>st</sup> August and 31<sup>st</sup> December 2015 when the 24 hour mean value exceeded 50µg/m<sup>3</sup>. These were:

- 50.8 µg/m<sup>3</sup> recorded at Shipley Airedale Road on 27<sup>th</sup> October 2015
- 55.2 µg/m<sup>3</sup> recorded at Shipley Airedale Road on 28<sup>th</sup> December 2015

35 exceedances of the 50µg/m<sup>3</sup> objective are allowed at any one site per annum, therefore the 24 hour daily mean objective was complied with in Bradford during 2015.

### **2.2.3 Particulate Matter (PM<sub>2.5</sub>)**

Table A.7 in Appendix A presents the ratified and adjusted monitored PM<sub>2.5</sub> annual mean concentrations for the previous 5 years.

The levels of PM<sub>2.5</sub> measured in Bradford during 2015 were all below the current EU annual average limit value of 25 µg/m<sup>3</sup>.

The annual average concentration of PM<sub>2.5</sub> recorded at the Shipley Airedale Road monitoring site in 2015 was slightly higher than that recorded in the previous two

years, but the magnitude of change can be explained by variations in weather conditions and/ or the changing of the monitoring technique from a TEOM to FDMS based system. Monitoring of PM<sub>2.5</sub> is now ongoing at Shipley Road using the new FDMS system.

There is no PM<sub>2.5</sub> trend data for Bingley and Keighley available, but the levels recorded during 2015 were within the expected levels for an urban background site. PM<sub>2.5</sub> monitoring is continuing at Keighley, but the Bingley site is to be re-located to a roadside position on Tong Street where it will provide information about roadside PM<sub>2.5</sub> levels in that locality.

#### **2.2.4 Sulphur Dioxide (SO<sub>2</sub>)**

There is no ratified SO<sub>2</sub> monitoring data available for Bradford for 2015. SO<sub>2</sub> monitoring undertaken previously in Bradford recorded levels well below the national air quality objective levels and there are no reasons to suggest that this position will have changed in the intervening years.

## Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Monitoring Technique	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
CM1	Bingley	Urban Background	410881	438942	NO <sub>2</sub> ; PM <sub>10</sub>	N	Chemiluminescent; FDMS	N/A	5	2.7
CM2	Keighley	Urban Centre	410881	438942	NO <sub>2</sub> ; PM <sub>10</sub>	N	Chemiluminescent; FDMS	N/A	5	2.7
CM3	Manningham Lane	Roadside	415887	433047	NO <sub>2</sub>	Y	Chemiluminescent;	0	1.5	1.5
CM4	Manchester Road / Mayo Avenue)	Roadside	415933	430569	NO <sub>2</sub>	Y	Chemiluminescent;	0	2.0	1.5
CM5	Thornton Road	Roadside	415887	433027	NO <sub>2</sub>	Y	Chemiluminescent;	0	2.0	1.5
CM6	Shipley Airedale Road	Roadside	416967	433265	NO <sub>2</sub> ; PM <sub>10</sub>	Y	Chemiluminescent; FDMS	0.2	2.0	2.7
CM7	Rook Lane / Rooley Lane	Roadside	415377	433605	NO <sub>2</sub>	N	Chemiluminescent;	4	1.5	1.5

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
DT5	Harrogate Road	kerbside	417982	434886	NO <sub>2</sub>	No	1	<0.5m	No	2.5 - 2.6
DT39	Harrogate Road	kerbside	417927	434799	NO <sub>2</sub>	No	1	1m	No	2.5 - 2.6
DT40	Dudley Hill Road	kerbside	417886	434827	NO <sub>2</sub>	No	1	1m	No	2.5 - 2.6
DT41	Summerset Place	background	417850	434795	NO <sub>2</sub>	No	0	10m	No	2.5 - 2.6
DT42	Killinghall	roadside	417902	434751	NO <sub>2</sub>	No	2	1m	No	2.5 - 2.6
DT12	Treadwell Mills	roadside	416970	433258	NO <sub>2</sub>	Yes	1.5	1.5m	No	2.5 - 2.6
DT45	Rook Lane	roadside	417877	430717	NO <sub>2</sub>	No	0 (garden) 3 (house)	1.5m	No	2.5 - 2.6
DT30	29 Saltaire Road	roadside	413861	437772	NO <sub>2</sub>	No	2	1.2m	No	2.5 - 2.6
DT32	80 Bradford Road	roadside	413534	437708	NO <sub>2</sub>	No	2	1.2m	No	2.5 - 2.6
DT49	9 Moorhead Lane	roadside	413604	437658	NO <sub>2</sub>	No	0 (garden) 4 (house)	1.5	No	2.5 - 2.6
DT50	203 Bradford Rd	roadside	413512	437730	NO <sub>2</sub>	No	2	2.0	No	2.5 - 2.6
DT68	Keighley AQ station	roadside	406058	441273	NO <sub>2</sub>	No	N/A	5.0	Yes	3

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
DT69	Keighley AQ station	roadside	406060	441273	NO <sub>2</sub>	No	N/A	5.0	Yes	3
DT70	Keighley AQ station	roadside	406062	441273	NO <sub>2</sub>	No	N/A	5.0	Yes	3
DT64	Tong Street	roadside	419379	430091	NO <sub>2</sub>	No	0	1.5	No	2.5 - 2.6
DT66	Holme Way	kerbside	419341	430225	NO <sub>2</sub>	No	0 (garden) 8 (house)	1	No	2.5 - 2.6
DT67	Broadstone Way	roadside	419203	430291	NO <sub>2</sub>	No	0	1.5	No	2.5 - 2.6
DT19	Cock & Bottle Public House	kerbside	416950	433436	NO <sub>2</sub>	Yes	N/A	<0.5m	No	2.5 - 2.6
DT21	Prospect Street, Keighley	kerbside	404694	404694	NO <sub>2</sub>	No	0	n/a	No	2.5 - 2.6
D71	Manningham Lane post 53	roadside	415887	433047	NO <sub>2</sub>	Yes	0	1.5	Yes (adjacent to)	2.5 - 2.6
D72	post 2 Queens Rd (traffic lights)	kerbside	415577	434518	NO <sub>2</sub>	Yes	0	1	No	2.5 - 2.6
D73	Canal Rd (opp garden centre)	roadside	415448	435812	NO <sub>2</sub>	No	50	n/a	No	2.5 - 2.6
D74	Gaisby Ln (above cycle path post 4)	kerbside	415549	435918	NO <sub>2</sub>	No	50	1	No	2.5 - 2.6

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
D75	Junction of Laisteridge Ln/Trinity Rd	kerbside	415505	432235	NO <sub>2</sub>	No	8 (college)	1	No	2.5 - 2.6
D76	Rook Ln /Tong St junction post 12	kerbside	418268	430732	NO <sub>2</sub>	No	0 (garden) 4 (house)	1	No	2.5 - 2.6
D77	Rooley Lane bus stop 535	kerbside	417982	431058	NO <sub>2</sub>	No	0 ( house)	1	No	2.5 - 2.6
D78	Aireworth Road	kerbside	407380	441811	NO <sub>2</sub>	No	0 (garden) 3.5 (house)	0	No	2.5 - 2.6
D79	Centenary Square	background	416282	432966	NO <sub>2</sub>	No	0 (cafes) (hourly NO <sub>2</sub> )	70	No	2.5 - 2.6
D80	City Exchange	kerbside	416388	432817	NO <sub>2</sub>	No	1	1	No	2.5 - 2.6
D81	Interchange bus entrance	kerbside	416413	432674	NO <sub>2</sub>	No	1	1	No	2.5 - 2.6
D82	Sharpe St	kerbside	416288	432652	NO <sub>2</sub>	No	30 (flats)	0	No	2.5 - 2.6
D83	Sharpe St (Car Park)	kerbside	416154	432638	NO <sub>2</sub>	No	25m (flats)	0	No	2.5 - 2.6
D84	Wilton St	kerbside	416054	432675	NO <sub>2</sub>	No	5 (house)	0	No	2.5 - 2.6
D85	Ice Rink- Corner Wardley Hse	kerbside	416092	432676	NO <sub>2</sub>	No	6 (flats)	0	No	2.5 - 2.6

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
CM1	Bingley	Automatic	n/a	89%	21	24	18	22	22
CM2	Keighley	Automatic	n/a	89%	29	29	27	27	28
CM3	Manningham Lane	Automatic	n/a	78%	n/a	-	-	35	<b>42</b>
CM4	Manchester Road / Mayo Avenue)	Automatic	n/a	94%	<b><u>71</u></b>	<b><u>72</u></b>	<b><u>75</u></b>	<b>42</b>	<b>42</b>
CM5	Thornton Road	Automatic	n/a	88%	n/a	<b>50</b>	<b><u>63</u></b>	<b>51</b>	33
CM6	Shipley Airedale Road	Automatic	n/a	86%	<b>54</b>	<b>52</b>	<b>52</b>	<b>54</b>	<b>48</b>
CM7	Rook Lane / Rooley Lane	Automatic	n/a	84%	n/a	-	-	<b>57</b>	34
DT5	Harrogate Road	Diffusion tube	n/a	91.7%	n/a	39	<b>43</b>	<b>42</b>	40
DT39	Harrogate Road	Diffusion tube	n/a	91.7%	n/a	37	36	<b>46</b>	37
DT40	Dudley Hill Road	Diffusion tube	n/a	91.7%	28	26	28	35	26
DT41	Summerset Place	Diffusion tube	n/a	91.7%	n/a	26	28	36	20
DT42	Killinghall	Diffusion tube	n/a	91.7%	n/a	<b>54</b>	<b>57</b>	<b>57</b>	<b>45</b>
DT12	Treadwell Mills	Diffusion tube	n/a	91.7%	<b><u>75</u></b>	<b><u>68</u></b>	<b><u>66</u></b>	<b><u>84</u></b>	<b><u>66</u></b>
DT45	Rook Lane	Diffusion tube	n/a	91.7%	<b>42</b>	37	<b>46</b>	<b>51</b>	37
DT30	29 Saltaire Road	Diffusion tube	n/a	91.7%	<b>53</b>	<b>45</b>	n/a	<b>49</b>	39

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
DT32	80 Bradford Road	Diffusion tube	n/a	75%	<b>50</b>	<b>49</b>	<b><u>61</u></b>	<b>42</b>	<b>49</b>
DT49	9 Moorhead Lane	Diffusion tube	n/a	83.3%	<b>52</b>	37	<b>42</b>	<b>46</b>	33
DT50	203 Bradford Road	Diffusion tube	n/a	75%	38	<b><u>79</u></b>	<b>47</b>	<b>57</b>	<b>56</b>
DT68	Co-located at Keighley AQ station	Diffusion tube	n/a	83.3%	31	37	30	34	30
DT69	Co-located at Keighley AQ station	Diffusion tube	n/a	83.3%	29	31	29	35	30
DT70	Co-located at Keighley AQ station	Diffusion tube	n/a	83.3%	29	40	32	39	31
DT64	Tong Street	Diffusion tube	n/a	91.7%	n/a	<b>49</b>	<b>58</b>	<b>58</b>	38
DT66	Holme Way	Diffusion tube	n/a	91.7%	n/a	36	34	39	32
DT67	Broadstone Way	Diffusion tube	n/a	91.7%	n/a	27	29	<b>45</b>	38
DT19	Cock & Bottle Public House	Diffusion tube	n/a	91.7%	n/a	<b><u>110</u></b>	<b><u>66</u></b>	<b><u>74</u></b>	<b>53</b>
DT21	12 Prospect St Keighley	Diffusion tube	n/a	50%	n/a	24	29	21	17
D71	Manningham Lane post 53	Diffusion tube	100%	41.6%	n/a	n/a	n/a	n/a	40
D72	Queens Rd (traffic lights post 2 )	Diffusion tube	100%	58.3%	<b><u>63</u></b>	<b><u>79</u></b>	n/a	n/a	<b><u>60</u></b>
D73	Canal Rd (opp garden centre post 61)	Diffusion tube	100%	58.3%	n/a	n/a	n/a	n/a	<b>51</b>

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
D74	Gaisby Ln (above cycle path post 4)	Diffusion tube	100%	33.3%	n/a	n/a	n/a	n/a	25
D75	Laisteridge Ln/Trinity Rd junction post 39	Diffusion tube	100%	58.3%	n/a	n/a	n/a	n/a	28
D76	Rook Ln/Tong St junction post 12	Diffusion tube	83.3%	41.6%	n/a	n/a	n/a	n/a	<b>41</b>
D77	Rooley Lane bus stop 535	Diffusion tube	85.7%	50%	n/a	n/a	n/a	n/a	<b>51</b>
D78	Aireworth Road	Diffusion tube	100%	58.3%	n/a	n/a	n/a	n/a	27
D79	Centenary Square	Diffusion tube	100%	50%	n/a	n/a	n/a	n/a	33
D80	City Exchange	Diffusion tube	66.6%	33.3%	n/a	n/a	n/a	n/a	34
D81	Interchange bus entrance	Diffusion tube	83.3%	41.6%	n/a	n/a	n/a	n/a	36
D82	Sharpe St	Diffusion tube	n/a	83.3%	n/a	n/a	n/a	n/a	37
D83	Sharpe St (Car Park)	Diffusion tube	n/a	83.3%	n/a	n/a	n/a	n/a	29
D84	Wilton St	Diffusion tube	n/a	91.7%	n/a	n/a	n/a	n/a	32
D85	Ice Rink-Corner Wardley Hse	Diffusion tube	n/a	91.7%	n/a	n/a	n/a	n/a	31

Notes: Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.4 – 1-Hour Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup> <sup>(3)</sup>				
					2011	2012	2013	2014	2015
CM1	Bingley	Automatic	89%	n/a	0	<b>44</b>	0	0	0
CM2	Keighley	Automatic	89%	n/a	0	0	0	0	0
CM3	Manningham Lane	Automatic	78%	n/a	-	-	-	0 (116)	0
CM4	Manchester Road / Mayo Avenue)	Automatic	94%	n/a	<b>39</b>	<b>43 (182)</b>	<b>84(193)</b>	<b>34</b>	0
CM5	Thornton Road	Automatic	88%	n/a	0	0	0	<b>141 (306)</b>	0
CM6	Shipley Airedale Road	Automatic	86%	n/a	0	1	0	0 (135)	0
CM7	Rook Lane / Rooley Lane	Automatic	84%	n/a	-	-	-	<b>106 (293)</b>	0

Notes: Exceedances of the NO<sub>2</sub> 1-hour mean objective (200µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in **bold**.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 99.8<sup>th</sup> percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM<sub>10</sub> Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	PM <sub>10</sub> Annual Mean Concentration (µg/m <sup>3</sup> )				
				2011	2012	2013	2014	2015
CM1	Urban Background	n/a	69%	12.0	15.0	15.4	13.3	12.6
CM2	Urban Centre	n/a	88%	13.0	17.3	16.6	12.4	14.0
CM6	Roadside	81%	30%	30	n/a <sup>4</sup>	n/a	n/a	20.6(19.6) <sup>3</sup>

Notes: Exceedances of the PM<sub>10</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%). Capture based on hourly mean results

(3) Value in brackets is annualised mean value (see Appendix C) as data was only collected between 21<sup>st</sup> August 2015 and 31<sup>st</sup> Dec 2015

(4) Between 2012 and 2014 the PM10 TEOM head at CM6 was replaced with a PM2.5 TEOM head. A new dual PM10 / PM2.5 FDMS system was installed in August 2015.

Table A.6 – 24-Hour Mean PM<sub>10</sub> Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM <sub>10</sub> 24-Hour Means > 50µg/m <sup>3</sup> )				
				2011	2012	2013	2014	2015
CM1	Urban Background	n/a	65%	0	3(28.9)	3(25.37)	1 (24.2)	1(22.9)
CM2	Urban Centre	n/a	91.5%	0	7(30.6)	2(25.5)	3 (23.3)	1
CM6	Roadside	86%	34%	20	n/a <sup>4</sup>	n/a	n/a	2

Notes: Exceedances of the PM<sub>10</sub> 24-hour mean objective (50µg/m<sup>3</sup> not to be exceeded more than 35 times/year) are shown in **bold**.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%). Capture based on number of 24 hour mean results

(3) If the period of valid data is less than 85%, the 90.4<sup>th</sup> percentile of 24-hour means is provided in brackets.

(4) Between 2012 and 2014 the PM10 TEOM head at CM6 was replaced with a PM2.5 TEOM head. A new dual PM10 / PM2.5 FDMS system was installed in August 2015.

Table A.7 – PM<sub>2.5</sub> Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	PM <sub>2.5</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
				2011	2012	2013	2014	2015
CM1	Urban Background	n/a	61.9%	n/a	n/a	n/a	n/a	9.3
CM2	Urban Centre	88.3%	49.3%	n/a	n/a	n/a	n/a	9.5
CM6	Roadside	88.5%	49.3%	n/a	n/a	10.4	11.0	13.1

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) The PM<sub>2.5</sub> means have not been annualised as there was insufficient local PM<sub>2.5</sub> data available to do so.

## Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO<sub>2</sub> Monthly Diffusion Tube Results - 2015

Site ID	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>	
DT5	no result	56	39	53	41	38	49	55	61	68	62	60	52.9	40.2	
DT39	no result	45	23	60	35	33	36	52	70	69	51	55	48.1	36.5	
DT40	no result	31	27	42	19	20	22	29	52	49	39	50	34.5	26.3	
DT41	no result	31	24	30	13	19	16	20	37	35	28	37	26.4	20.0	
DT42	no result	62	51	54	47	47	46	63	76	75	67	59	58.8	<b>44.7</b>	
DT12	no result	93	92	94	74	60	60	89	101	100	106	86	86.8	<b>66.0</b>	
DT45	no result	53	44	45	49	28	35	46	57	60	63	49	48.1	36.5	
DT30	no result	55	54	52	37	36	39	55	73	72	29	60	51.1	38.8	
DT32	no result	no result	no result	72	59	48	51	68	76	84	59	63	64.4	<b>49.0</b>	
DT49	no result	47	43	43	34	34	28	no result	52	44	64	49	43.8	33.3	
DT50	no result	80	56	81	74	69	72	no result	87	83	no result	56	73.1	<b>55.6</b>	
DT68	no result	40	30	41	33	32	30	no result	48	49	43	51	39.7	30.2	
DT69	no result	32	34	38	32	33	28	no result	47	56	42	47	38.9	29.6	
DT70	no result	44	35	34	30	31	31	no result	52	53	45	49	40.4	30.7	
DT64	no result	54	34	63	41	39	42	51	64	67	49	46	50.0	38.0	
DT66	no result	46	36	44	38	28	27	40	42	57	51	53	42.0	31.9	
DT67	no result	60	57	54	46	28	23	38	46	61	66	74	50.3	38.2	
DT19	no result	77	52	78	54	55	66	51	90	89	69	80	69.2	<b>52.6</b>	
DT21	no result	no result	no result	no result	32	no result	no result	12	20	23	15	27	21.5	16.6	
DT71	n/a	n/a	n/a	n/a	n/a	n/a	n/a	55	66	63	47	46	55.4	<b>40.2</b>	
DT72	n/a	n/a	n/a	n/a	n/a	60	61	75	101	85	77	75	76.3	36.5	
DT73	n/a	n/a	n/a	n/a	n/a	40	51	63	74	81	72	74	65.0	26.3	

Site ID	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>	
	DT74	n/a	n/a	n/a	n/a	n/a	no result	no result	no result	34	41	33			38
DT75	n/a	n/a	n/a	n/a	n/a	22	20	34	64	42	28	37	35.3	<b>44.7</b>	
DT76	n/a	n/a	n/a	n/a	n/a	no result	no result	64	no result	58	51	48	55.3	<b>66.0</b>	
DT77	n/a	n/a	n/a	n/a	n/a	47	45	88	60	93	no result	56	64.8	36.5	
D78	n/a	n/a	n/a	n/a	n/a	23	22	29	40	39	48	40	34.4	38.8	
D79	n/a	n/a	n/a	n/a	n/a	n/a	24	32	62	54	44	49	44.2	33.4	
DT80	n/a	n/a	n/a	n/a	n/a	n/a	29	42	52	59	no result	no result	45.5	33.8	
DT81	n/a	n/a	n/a	n/a	n/a	n/a	24	44	58	no result	43	51	44.0	35.6	
DT82	44	no result	45	47	33	no result	34	43	59	68	52	63	48.8	37.1	
DT83	35	no result	29	42	no result	29	25	33	57	53	40	40	38.3	29.1	
DT84	44	no result	34	46	32	31	29	40	62	61	45	43	42.5	32.3	
DT85	41	no result	39	43	28	27	28	36	61	62	37	48	40.9	31.1	

(1) See Appendix C for details on bias adjustment

## Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

### C 1.0 Diffusion tube preparation

All diffusion tubes used in conjunction with this report were prepared by West Yorkshire Analytical services using 50% TEA in acetone.

WYAS participate in the Inter-laboratory comparison scheme AIR PT. This is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. AIR PT offers a number of test samples designed to test the proficiency of laboratories undertaking analysis of chemical pollutants in ambient indoor, stack and workplace air. One such sample is the AIR NO<sub>2</sub> test sample type that is distributed to participants in a quarterly basis. The results of this scheme are published annually.

The AIR PT NO<sub>2</sub> diffusion tube results for WYAS for the period covered by this progress report are shown in Table C.1

**Table C.1 AIR PT NO<sub>2</sub> diffusion tube results for WYAS (2015)**

AIR round	Result for WYAS
January – March 2015	100%
April – June 2015	75%
July – September 2015	75%
October – December 2015	75%

The average WASP result for the 2015 period was 81.25% which is acceptable. Bradford MDC will monitor future WASP results and consider changing supplier if there is any further deterioration in performance.

## C 2.0 Nitrogen Dioxide Bias Factors

Local nitrogen dioxide diffusion tube bias factors are not available from the Bradford district monitoring network. The NO<sub>2</sub> tube results reported within this report have been corrected for bias using the factors provided on the LAQM support website (DEFRA spreadsheet version 03/16). These factors are derived from co-location studies in other areas using WYAS tubes.

The bias factor used in this report was **0.76**

## C 3.0 PM Monitoring Adjustment

The PM<sub>10</sub> and PM<sub>2.5</sub> data within this report was collected using dual PM<sub>10</sub>/ PM<sub>2.5</sub> FDMS measurement systems. It has been subject to ratification and verification checks, but has not been corrected for volatility as this is not necessary for FDMS measurements.

## C 4.0 QA/QC of Automatic Monitoring

The City of Bradford Metropolitan District Council's air quality analysers are type approved as recommended in LAQM.TG1 (00) *Review and Assessment: Monitoring air quality* and LAQM.TG4 (00) *Review and assessment: Pollutant specific guidance*.

The Council's own automatic network is operated by council officers trained by the instrument supplier. Signal Group provide routine maintenance and emergency repair services.

Bradford MDC air quality staff undertake Local Site operator duties at the Mayo Avenue monitoring station on behalf of DEFRA. Signal group currently provide routine maintenance and emergency repair services. Annual auditing of the site and data management is managed by DEFRA using their own contractors.

The monitoring sites have a programme of routine operational checks and programmed fortnightly site visits which include:

- Daily checks on data transfer, telephone lines and analyser operation (by Signal Group).
- Daily and monthly checks of data quality (by Signal Group).
- Prompt fault reporting and carrying out of repairs under a service agreement with the equipment supplier (Signal Group).

- Fortnightly manual calibration checks, site inspections of equipment status, site safety and security (by Bradford MDC staff).
- Programmed six-monthly servicing and calibration by equipment suppliers under service agreement (Signal Group)

### Maintenance systems

The Council's monitoring network of automatic continuous monitors is maintained in accordance with a schedule which is essentially similar to that employed for the AURN and affiliated sites. All analysers are maintained and serviced according to manufacturers specifications and have a six-monthly service and recalibration by Signal Ambitech, the suppliers of the equipment. The servicing, calibration, and repair documentation is kept in a central record. Routine maintenance is carried out at the two-weekly calibration site visit, and any faults are recorded with the calibration log for the visit. These records are kept on site and centrally at the Environmental Health Services Scientific and Technical Services Team office.

### Calibration Routines

A zero and span calibration check is performed every two weeks during the site inspection visit. The methodology used is essentially that found in the AURN Local Site Operators Manual issued by NETCEN, and the manufacturer's instruction manual.

The basic steps are:

- Pre-calibration check of the general site condition and status of the analyser, before the zero and span checks are performed.
- Zero check to verify the performance of the analyser in the absence of the gas being monitored.
- Span check to verify the response of the analyser to gas of a known concentration.
- Post calibration check of the general site condition and status of the analyser on completion of all calibration routines.

A record of each analyser zero and span check is fully documented and a record kept on site and also centrally.

## Calibration Gas Standards

The gases used for onsite span calibration checks are supplied by Air Liquide Ltd and are traceable via European Accreditation DIN EN 45001 and DIN EN ISO 900. The tolerance of the nitrogen dioxide and nitric oxide in air mixes is typically  $\pm 5\%$ , and for a sulphur dioxide in air mix, it is typically  $\pm 5\%$ .

Zero air is generated internally in the Ambirak, and the scrubbers are changed when necessary in accordance with manufacturer's recommendations and the NETCEN LSO Site Manual for the Ambirak.

## Data scaling, validation and ratification

Unscaled data is gathered every hour by an Ambidesk system located in the Scientific and Technical Services Team office. Scaling factors are applied automatically by the Ambidesk software using factors derived during the fortnightly calibration check and the daily automatic internal calibration checks at the Ambirak.

A daily report is generated to enable unusual readings to be identified. Monthly reports are produced for further checks on data capture rates, and any other unusual variations in measured scaled data. The original raw unscaled data is retained on disk at the Ambirak in the event of anomalous scaled data events.

Where unusual or unexpected results are obtained from an individual site, comparisons are undertaken with data from other monitoring locations inside and outside the Bradford district and the past history of the analyser in terms of reliability and recent breakdowns is taken into consideration. Any data considered to be unrepresentative of actual ambient conditions is removed from the data set prior to preparation of summary reports.

## Short-term to Long-term Data Adjustment

Short to long term data adjustment has been undertaken for diffusion tube data (where applicable) and annual average PM<sub>10</sub> data from Shipley Airedale Road for the purpose of this report. These are detailed below.

### C 4.1 Annualisation of PM<sub>10</sub> data for Shipley Airedale Road

The PM<sub>10</sub> data reported for Shipley Airedale Road covers the period 21<sup>st</sup> August 2015 to 31<sup>st</sup> December 2015. The data has therefore been annualised using data from the Keighley Urban Centre site and the York Bootham AURN urban background

site. PM<sub>10</sub> data capture at the Bingley site for 2015 was too low for use in annualisation calculations. An annualisation factor of 0.95 has been used to annualise the Shipley Airedale Road PM<sub>10</sub> data as detailed in Table C.1 below

**Table C.4.1 Annualisation factor for Shipley Airedale Road PM<sub>10</sub> data**

Site	Annual Mean 2015 $A_m$	Period Mean Pm (21 <sup>st</sup> August to 31 <sup>st</sup> December)	Ratio (Am/Pm)
Keighley	14.00	15.93	0.88
Bootham	15.25	15.01	1.02
Average ratio			0.95

**C 4.2 Annualisation of NO<sub>2</sub> diffusion tube data**

Where diffusion tube monitoring is only undertaken for part of a year and/or where annual data capture is less than 75%, the annual averages require annualisation to take account of any seasonal variation in concentration.

The diffusion tube measurements undertaken in Bradford during 2015 have been annualised using NO<sub>2</sub> data from the Keighley and Bingley background sites. The calculations are detailed below.

**Table C.4.2 Diffusion tube annualisation calculations**

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT21</b>					32			12	20	23	15	27	21.5
Annual Mean - RT-keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley					10.61			13.31	16.45	18.07	14.82	15.00	14.71178
Period Mean RT Bingley					6.97			8.45	11.56	15.33	10.84	9.21	10.39445
Ratio Am/PM Keighley													0.993706
Ratio Am/PM Bingley													1.042251
Average ratio													1.017978
Annualised mean													<b>21.88654</b>

## City of Bradford MDC

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT71</b>								55	66	63	47	46	55.4
Annual Mean - RT-keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley								13.31	16.45	18.07	14.82	15.00	15.53297
Period Mean RT Bingley								8.45	11.56	15.33	10.84	9.21	11.07836
Ratio Am/PM Keighley													0.941172
Ratio Am/PM Bingley													0.977908
Average ratio													0.95954
<b>Annualised mean</b>													<b>53.15852</b>

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT72</b>						60	61	75	101	85	77	75	76.286
Annual Mean - RT-keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley						12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.85212
Period Mean RT Bingley						8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.14764
Ratio Am/PM Keighley													0.984317
Ratio Am/PM Bingley													1.0676
Average ratio													1.025958
<b>Annualised mean</b>													<b>78.26595</b>

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT73</b>						40	51	63	74	81	72	74	65
Annual Mean - RT-keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley						12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.85212
Period Mean RT Bingley						8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.14764
Ratio Am/PM Keighley													0.984317
Ratio Am/PM Bingley													1.0676
Average ratio													1.025958
<b>Annualised mean</b>													<b>66.68728</b>

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	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT74</b>									34	41	33	38	36.5
Annual Mean - RT-Keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT Bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley									16.45	18.07	14.82	15.00	16.08785
Period Mean RT Bingley									11.56	15.33	10.84	9.21	11.73524
Ratio Am/PM Keighley													0.90871
Ratio Am/PM Bingley													0.92317
Average ratio													0.91594
<b>Annualised mean</b>													<b>33.43181</b>

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT75</b>						22	20	34	64	42	28	37	35.28571
Annual Mean - RT-Keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT Bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley						12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.85212
Period Mean RT Bingley						8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.14764
Ratio Am/PM Keighley													0.984317
Ratio Am/PM Bingley													1.0676
Average ratio													1.025958
<b>Annualised mean</b>													<b>36.20167</b>

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT76</b>								64		58	51	48	55.25
Annual Mean - RT-Keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT Bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley								13.31		18.07	14.82	15.00	15.30333
Period Mean RT Bingley								8.45		15.33	10.84	9.21	10.95696
Ratio Am/PM Keighley													0.955295
Ratio Am/PM Bingley													0.988743
Average ratio													0.972019
<b>Annualised mean</b>													<b>53.70404</b>

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	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT77</b>						47	45	88	60	93		56	64.83333
Annual Mean - RT-keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley						12.35	13.95	13.31	16.45	18.07		15.00	14.85689
Period Mean RT Bingley						8.06	7.59	8.45	11.56	15.33		9.21	10.03165
Ratio Am/PM Keighley													0.984001
Ratio Am/PM Bingley													1.079943
Average ratio													1.031972
<b>Annualised mean</b>													<b>66.90619</b>

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT78</b>						23	22	29	40	39	48	40	34.42857
Annual Mean - RT-keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley						12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.85212
Period Mean RT Bingley						8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.14764
Ratio Am/PM Keighley													0.984317
Ratio Am/PM Bingley													1.0676
Average ratio													1.025958
<b>Annualised mean</b>													<b>35.32227</b>

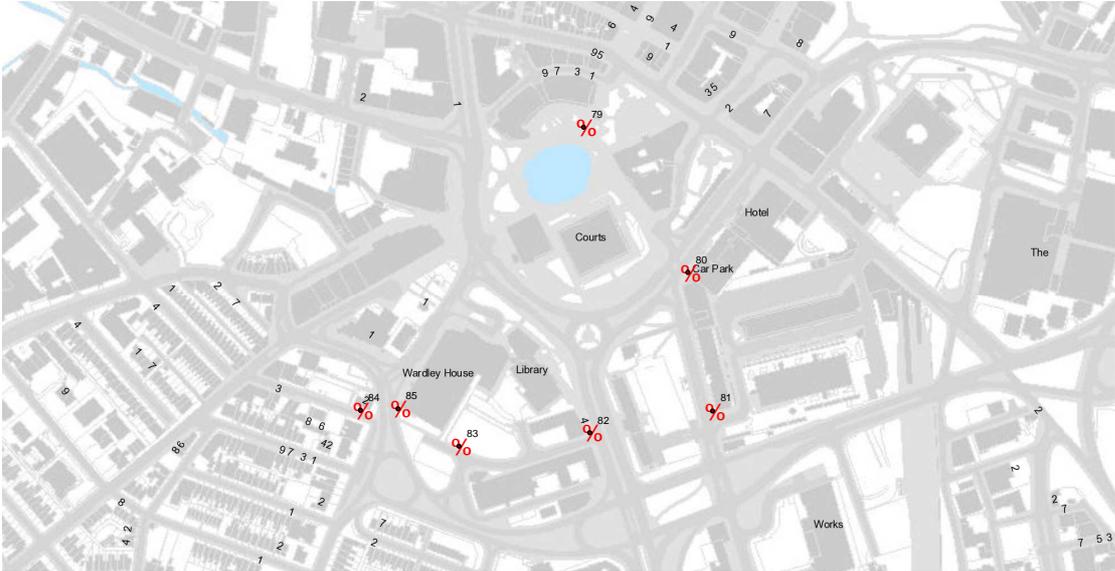
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT79</b>							24	32	62	54	44	49	44.16667
Annual Mean - RT-keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley							13.95	13.31	16.45	18.07	14.82	15.00	15.26898
Period Mean RT Bingley							7.59	8.45	11.56	15.33	10.84	9.21	10.49632
Ratio Am/PM Keighley													0.957444
Ratio Am/PM Bingley													1.032135
Average ratio													0.994789
<b>Annualised mean</b>													<b>43.93652</b>

## City of Bradford MDC

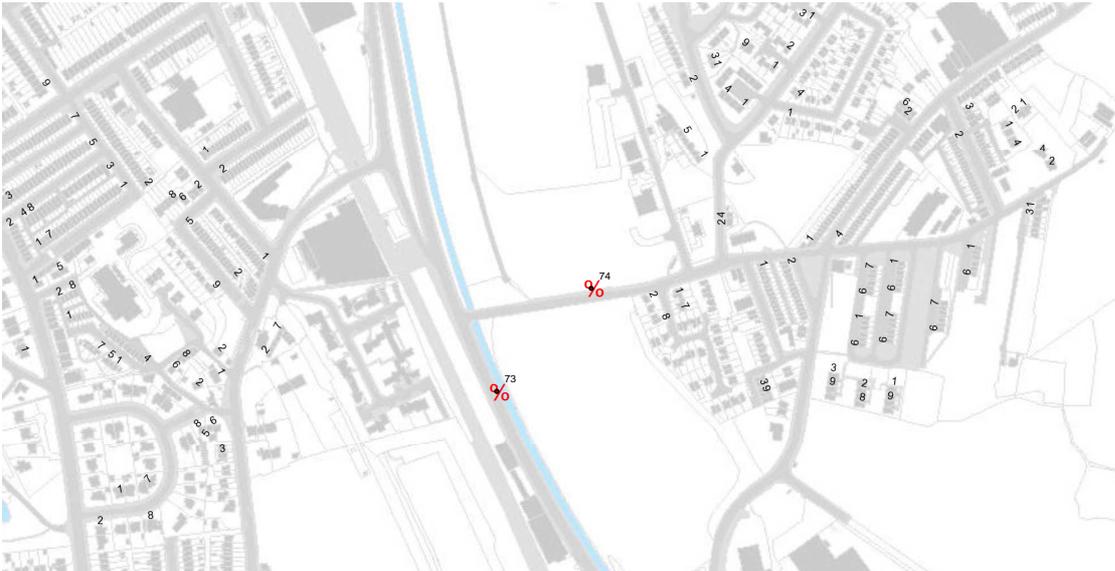
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT80</b>							29	42	52	59			45.5
Annual Mean - RT-keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley							13.95	13.31	16.45	18.07			15.44649
Period Mean RT Bingley							7.59	8.45	11.56	15.33			10.73211
Ratio Am/PM Keighley													0.946441
Ratio Am/PM Bingley													1.009458
Average ratio													0.97795
<b>Annualised mean</b>													<b>44.4967</b>

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean
<b>DT81</b>							24	44	58		43	51	44
Annual Mean - RT-keighley	14.15	16.95	14.14	15.62	10.61	12.35	13.95	13.31	16.45	18.07	14.82	15.00	14.61919
Annual Mean - RT bingley	12.18	15.00	12.91	11.90	6.97	8.06	7.59	8.45	11.56	15.33	10.84	9.21	10.83362
Period Mean RT Keighley							13.95	13.31	16.45		14.82	15.00	14.70839
Period Mean RT Bingley							7.59	8.45	11.56		10.84	9.21	9.530076
Ratio Am/PM Keighley													0.993936
Ratio Am/PM Bingley													1.136782
Average ratio													1.065359
<b>Annualised mean</b>													<b>46.87578</b>

# Appendix D: Map(s) of Monitoring Locations

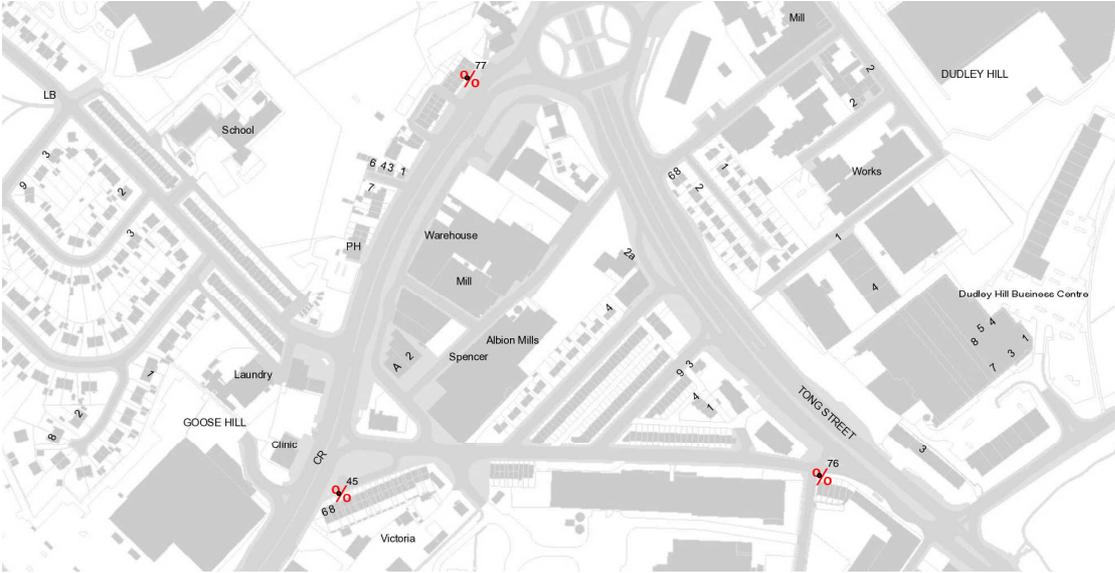


City Centre NOx Tubes (new nitrogen dioxide tube monitoring)



Canal Road NOx Tubes (new nitrogen dioxide tube monitoring)

Rook Lane and Tong Street (new nitrogen dioxide tube monitoring)



## Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective <sup>11</sup>	
	Concentration	Measured as
Nitrogen Dioxide (NO <sub>2</sub> )	200 µg/m <sup>3</sup> , not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Particulate Matter (PM <sub>10</sub> )	50 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Sulphur Dioxide (SO <sub>2</sub> )	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean

<sup>11</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).

## Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide
...	...

## References

See footnotes for individual references

Bradford Air Quality Publications

<https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/>

Local Air Quality Management Technical Guidance TG.09

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69334/pb13081-tech-guidance-laqm-tg-09-090218.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69334/pb13081-tech-guidance-laqm-tg-09-090218.pdf)